CMR

california management review

A PUBLICATION OF THE GRADUATE SCHOOLS OF BUSINESS ADMINISTRATION
UNIVERSITY OF CALIFORNIA, BERKELEY AND LOS ANGELES

COMPUTER-BASED CONTROL SYSTEMS 4

LABOR RELATIONS IN BRITAIN 16

THE SUPPLY OF URBAN LAND RUNNING OUT? 28

EXPERIENCES WITH A COMPLEX MANAGEMENT GAME 38
W. R. Dill, William [illegible]

SOCIOCHREMATICS AND ORGANIZATION 52

A PUBLIC CORPORATION IS A PUBLIC TRUST 72

CAPITAL BUDGETING AND MERCHANDISING 82

POLITICS IN A CORPORATE SOCIETY 105

SPRING 1961 • VOLUME III, 3

THE McKINSEY AWARD WINNERS FOR 1960

The Editors of the *California Management Review* take pride and pleasure in announcing that the McKinsey Foundation Awards for the best articles published in Volume II of CMR have been won by:

ERNEST DALE for his paper "**Some Foundations of Organization Theory**" which appeared in the fall issue (Volume II, Number 1) and

EDWIN B. GEORGE for his article on "**The Staggering Problems in Managing National Defense,**" published in the summer issue (Volume II, Number 4).

Dr. Dale, whose award includes an honorarium of $1,000, is President of Ernest Dale Associates, economic and organization counsel, and a member of the faculty of the Graduate School of Business Administration at Cornell University. He is a director of several corporations and has, in the last ten years, participated in a number of corporate reorganizations.

Edwin B. George, recipient of the $500 McKinsey Award, is Director of Economics for Dun & Bradstreet and Contributing Editor of *Dun's Review and Modern Industry*. In addition to these posts, which he has held since 1936, he is Chairman of the Program Advisory Committee of the Office of Civil and Defense Mobilization and has served as consultant to numerous government agencies.

Each of the Award articles was in its way controversial, designed to question time-honored practices in the field of management and present new, vital material upon which management can act in the conduct of its affairs.

Dr. Dale in "Some Foundations of Organization Theory" challenged the tradition that accepted universal principles of management work equally well for all enterprises and suggested instead a comparative approach based on actual, continuing study of successful businesses.

Mr. George in "The Staggering Problems in Managing National Defense" presented the grim facts of a military strategy and budgeting policy which must not only compensate for the missile gap but tackle the almost yet untouched problem of preserving enough of the civilian population and productive resources to rebuild in the event of massive, nuclear attack. His conclusions: "We can afford what we have to afford" and we must "maintain a sense of proportion."

The Editors think that 1960's Award articles deserve rereading by thoughtful subscribers. If your back copies are not at hand, reprints are available.

Published by the Graduate Schools of Business Administration, University of California, Berkeley and Los Angeles.

EDITORIAL BOARD:

EWALD T. GRETHER, *Dean, Berkeley*
NEIL H. JACOBY, *Dean, Los Angeles*
GEORGE A. STEINER, *Director of Division of Research, Los Angeles*
DAVID A. ALHADEFF, *Professor, Berkeley*
ELWOOD S. BUFFA, *Associate Professor, Los Angeles*

ADVISORY BOARD OF EDITORS:

DEAN ERNEST C. ARBUCKLE, *Graduate School of Business Administration, Stanford University*
DEAN G. L. BACH, *Graduate School of Industrial Administration, Carnegie Institute of Technology*
DEAN MAURICE W. LEE, *School of Business Administration, University of North Carolina*
DEAN HAROLD M. SOMERS, *School of Business Administration, University of Buffalo*
DEAN ROSS M. TRUMP, *Graduate School of Business Administration, Washington University*
DEAN WILLIS J. WINN, *Wharton School of Finance and Commerce, University of Pennsylvania*

CMR

california management review

SPRING, 1961 • VOLUME III • NUMBER 3

Edited under the direction of the Faculties of the Departments of Business Administration, University of California, Berkeley and Los Angeles.

Managing Editor, ELWOOD S. BUFFA
Berkeley Editor, DAVID A. ALHADEFF
Associate Editor, CHARLES KATZMAN
Assistant Editor, CHARLOTTE HUBER
Staff Artists, SAMUEL BHANG, GERALD MAFFEI

california management review
SPRING 1961 • VOLUME III • NUMBER 3

IN THIS ISSUE

4 AN APPROACH TO COMPUTER-BASED MANAGEMENT CONTROL SYSTEMS
D. G. Malcolm and A. J. Rowe

16 LABOR RELATIONS IN BRITAIN
Frederic Meyers

28 IS THE SUPPLY OF URBAN LAND RUNNING OUT?
Jack Lessinger

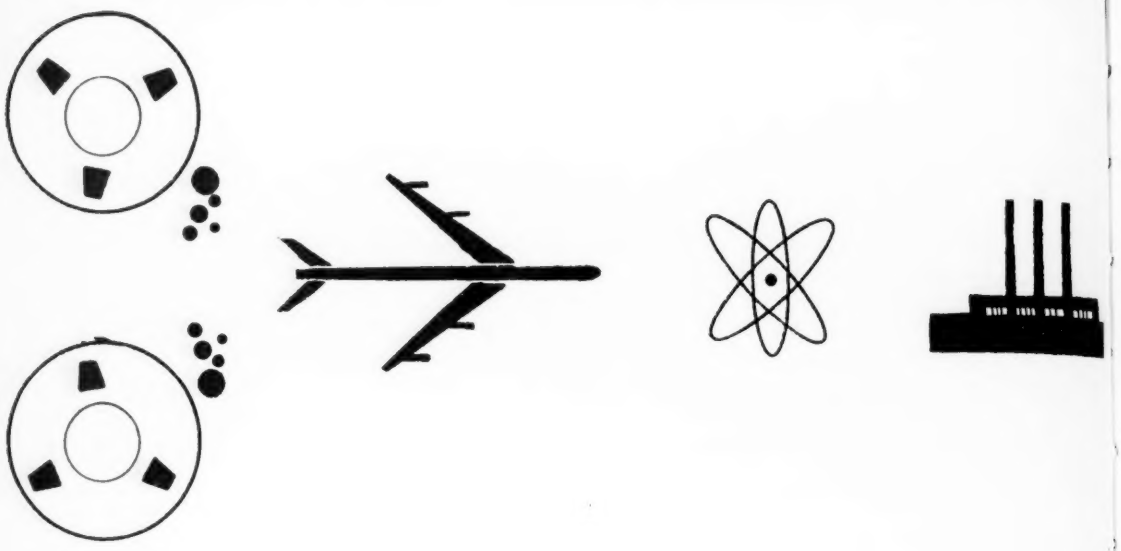
38 EXPERIENCES WITH A COMPLEX MANAGEMENT GAME
W. R. Dill, William Hoffman, H. J. Leavitt, and Thomas O'Mara

52 RHOCHREMATICS AND ORGANIZATIONAL ADJUSTMENTS
Stanley H. Brewer and James Rosenzweig

72 MANAGING A PUBLICLY OWNED CORPORATION IS A PUBLIC TRUST
Leo A. Weiss

82 A SIMPLIFIED CAPITAL BUDGETING APPROACH TO MERCHANDISE MANAGEMENT
Richard H. Holton

105 THE POLITICS OF A CHANGING CORPORATE SOCIETY
Dow Votaw



AN APPROACH TO COMPUTER-BASED MANAGEMENT CONTROL SYSTEMS

D. G. MALCOLM • A. J. ROWE

Will the computer ever replace management men in making top business decisions? Hardly, but military experience with SAGE and SACCS proves that when the machines go to work on the line, changes must be made in the command structure. The first step is research which the machine, using simulation models, does to develop a set of management principles. To learn what happens next and what may happen in the very near future, read this article.

Both of the authors of this paper, D. G. Malcolm and A. J. Rowe, are actively engaged in systems research for private industry. Mr. Malcolm is vice president of the Western Division of Operations Research Incorporated and Dr. Rowe is manager of Industrial Dynamics Research for the Hughes Aircraft Company. Initial research for this paper, which is an extension of material presented in their book Management Control Systems, *was done while they were both at the System Development Corporation.*

In an era of automated information technology, the ability to formulate decision criteria precisely and process information electronically should prove valuable in the design of management control systems. One can look forward to organizational structures which more nearly conform to the communication and informational requirements.

In an attempt to explore the problems facing management of large organizations and persons responsible for the design of management controls, the authors have embarked on an intensive research program in this area. Started in April of 1959, the research has been primarily concerned with studying computer-based management control systems.[1] By examining the flow of information and decision processes using computer simulation, insights into the behavior of these complex systems appear possible.

Nature of the Problem

Examining the problems confronting designers of management control systems, one is readily aware of the magnitude of the task. Although management and organizational specialists have been concerned with these same problems for many years, there still remain a large number of questions to be answered. For example:

- To what extent should top management go in developing a philosophy of "management by system?"
- How can top management determine the depth in the organization to which it should extend day-to-day personal influence?
- How can management evaluate proposed computer-based, information-processing, decision-making systems?
- How should management plan the development of an organization to achieve control?

These in turn raise a number of questions for the researcher as follows:

- What is a suitable method for determining the cost and effectiveness of management information or control systems?
- How can appropriate systems be designed prior to their actual installation?
- By what method can various types of information be expressed in terms of a company's over-all objectives?
- What is the best configuration of an integrated management control system?

Specialists have applied a wide variety of answers and approaches to these problems. Examples of traditional methods include: organizational planning, scheduling of operations, inventory control, quality control, and cost control.

It is significant to note that each of these is a component or single aspect of a business and the concept of an in-

tegrated total-system control remains practically unexploited. However, it is possible that concise, quantitative, and unequivocal answers to these questions may not be found for a long time.

Defining Management Controls

For the purpose of this paper, a management control system is described as a set of policies, procedures, and associated information processing designed to give direction to corporate activities in the following ways:

- By clearly establishing goals;
- By measuring progress in achieving these goals;
- By indicating the need for corrective action.

To achieve an optimal set of management controls, however, it is necessary to "design" a management system in much the same way that equipment itself is designed. As part of this design process, it is a basic requirement that the system designer clearly understand the objectives of the business.

In this regard the traditional statements of maximizing profit or return on investment are not sufficient guides. Modern business is conducted to serve many diverse objectives, making the problem of control more sophisticated than attempting to have each and every action directed toward such goals. Management, therefore, can be considered as the custodians of the resources of an organization with the mission to organize the effort to achieve purposeful objectives and to assure survival of the business.

As part of the control process, a communication network is used to link management with the resources of the business and to provide the information needed for feedback control. The information available to the manager, is therefore used as the basis for control and operating decisions. The core of the design problem, therefore, is in determining which operating decision rules can be reduced to a routine, computerized approach.

The characteristics of information flow and decision rules provide the basic inputs for a study of management controls. It is obvious that the interlinkage between decision points, as well as the density of information flow, has a direct effect on the nature of the organizational structure required for successful operation. Thus, the constraints of the existing organization must be ignored, and the specifications for an effective organization to make required decisions should be based on the system design activity.

Current Applications of Computers

Although there is an ever-increasing use of electronic data-processing equipment in the automating of existing information systems, the need to integrate the over-all informational requirements and to redesign a given system is often overlooked.

More generally, applications are made in one area of the business, such as finance or manufacturing, and little more than checks for compatibility are made with respect to the total system problem.

This piecemeal approach is most frequently justified on the grounds that one must build gradually in developing a total system. However, there is a growing recognition that this approach leads to suboptimal results.

In current applications, the use of electronic computers does not tap one-tenth of their ultimate potential. Although this condition is particularly true of industrial, as contrasted with military, applications, it is a situation

that will become a matter of increasing concern to those who use computers, especially as they realize the nature of this potential. The situation, conceivably, could become worse before effective long-range programs are designed and in use.

Applications in Military Systems

If one examines the Air Defense Command, it is readily apparent that the prototypes of highly automated information systems are currently being established for management use. Examples of such systems which operate with extremely short feedback time, often referred to as operating in real-time, can be seen in SAGE[2] (Semi-Automatic Ground Environment) and SACCS (Strategic Air Command Control System). Both of these systems are computer-based, command-control systems.

In the course of the design and implementation of these Systems, a number of changes were made in the Air Defense Command structure. The computer control system itself was used as the basis for organizational changes which led to the centralization of many activities.

A further development which was necessitated by the requirement for design and implementation was the concept of a system manager. The ESSPO (Electronic Support Systems Project Office), was given the mission of properly managing the joint efforts of system analysis, system design, computer manufacturing, computer programming and system training.

Real-Time Control

In military applications, the computer has been used as an integral, on-line controlling device. In this context, the terms, "real-time control," "communication," and "information system," emerge as system design concepts.

"Real-time" is used to mean that the desired information is transmitted into a centralized computer instantaneously and without conversion. The significance of "real-time" control lies in the fact that information is used as it is developed and that elements in the system are controlled by the processed information immediately, not after the fact, or by making periodic forecasts of the expected future state of the system.

To achieve "real-time" control, the computer processes information, compares it with predetermined decision criteria and issues instructions to men or machines, or both, for corrective or purposeful action. Further, the computer, by means of direct outputs, informs affected parties of this information as it is developed. This is "real-time management information."

By examining the best known examples of systems of this type currently found in the military, one may find some guidance in design approaches that may be useful in evolving better on-line management control systems for industry.

Military Systems

The experience gained in the development of military command control systems can be summarized under the following topics:

- Use of the Systems Analysis Approach,
- Problem Formulation for Computer Programming,
- Use of New Computer Applications, and
- Use of Formalized System Training.

While the following are broad generalizations, it would appear that the quickest route to effective development of a truly integrated management control system involves a proper point of view on the part of management in regard to the possible effects of information flow on the organization structure. That is, the possibility of recentralizing and the eliminating of certain functions must be within the system designer's scope.

Further, to perform a system analysis there must be proper organizational status for the design function and top management must plan for the necessary lead time to perform its activities. Finally, while it should be evident, it is worth emphasizing that top management participation and support is vital to obtain desired results.

Systems Analysis Approach

In reviewing the development of a system such as SAGE, one is impressed with the magnitude of the design process. The design of this system necessitated spelling out precise system requirements. This, in turn, provided the basis for more effectively meeting the needs of the air defense system.

In contrast to the systems approach, the question that is often asked is "What can be done to improve or automate existing practices?" In looking over the process of creating new management control systems, it becomes obvious that this latter approach is often the easiest to justify and, thus, has been the route traditionally followed.

In essence, the design process is based on answering the question "What is the best system?" and is generally called the systems analysis, or systems engineering, approach. Thus, one principle in creating a new system involves a careful look at the requirements of the system via the systems engineering approach. A brief description of the steps generally involved is as follows:

1. *Establish criteria for management information needs:* (a) Establish the objectives or mission of the system. (b) Determine current information, decision, display, and report practices, by use of graphical flow analyses.
2. *Develop the preliminary design:* (a) A preliminary statement of system requirements; i.e., specific reporting frequencies, types, and routings of reports, type of equipments, displays, etc., should be established. (b) Determine what can be automated using computer programming and what to leave as currently performed. We must remember here that technology is changing rapidly. Simon[3] predicts that by 1984 it will be technically possible to automate any and all functions in an organization. (c) Balance current requirements with growth considerations.
3. *Evaluate the preliminary design:* (a) Determine the cost of hardware and applicable costs. (b) Assess training implications and requirements. (c) Establish the nature of the improvements to be gained.
4. *Develop a revised model of the proposed system:* (a) Use of systems analysis or an experimental approach involving simulation or gaming, to test the design. (b) Obtain the participation of the ultimate users.
5. *Determine system specifications:* (a) Evaluate alternative means of achieving the proposed design. (b) Consider the relationship to other system requirements.

6. *Install, de-bug, modify, extend the system:* (a) Provide for maintenance and updating. (b) Allow for flexibility in operating and modifying the system.

Computer Problem Formulation

In the application of computer-based systems, it has become evident that there is a need for precise formulation of the computer program. Descriptive statements are not sufficient, rather quantitative or analytic formulation of problems is required.

Furthermore, factors such as kind and size of memory, speed of computation, manner of indexing, and rounding must all be taken into account in computer programming. Methods of filing information, data accumulation, and reporting requirements are also significant aspects of program design.

It is often necessary to reformulate a problem to conform to the computer requirements; although this consideration is becoming less important with the availability of large-scale digital computers.

At the outset of a given computer program, a decision must be made whether to have a flexible, general purpose program or one designed for the immediate specific use. Modular programming which treats each section of a program separately provides considerable flexibility at only a small cost in computation time and storage.

Computer "Language"

Probably the most difficult aspect of the problem is the actual coding or programming language. Not only is the coding a time-consuming and difficult process, but the system designer must convey the intent of his work to programmers, thus compounding the problem.

Considerable effort is currently being expended in the development of computer languages which can be used more readily by system designers. This, in part, recognizes the fact that as much time is often spent in coding a problem as in the formulation. In this regard, then, considerable work remains to be done to develop computer languages which will simplify the operational instructions for the computer programming task.

Use of New Computer Applications

The capability of the computer to process information rapidly, store information conveniently and provide accuracy has made significant inroads on long-standing problems. Some of these computer applications are:

1. *On-line control:* As has been mentioned previously, on-line, direct read-in and read-out, integrated computer operation has been used in military systems. The importance of this technical achievement should not be underestimated. However, the feasibility of utilizing this on-line control feature for industrial application requires research and analysis to determine the cost and effectiveness of a given application.
2. *Management-by-exception:*[4] The data processing capability of high-speed computers, as used in the military, has made possible centralized operations using large masses of data which have been carefully sorted by built-in criteria. Only exceptions requiring attention are presented to decision makers by the computer. This feature could be extended to provide centralized control in management systems. PERT (Navy Polaris program) is an example.

3. *Interrogation, or fast-simulation possibilities:* Using a computer-based system, the human monitor can, in a sense, ask "What would happen if I issued this command?" This interrogation feature, often called "fast-simulation" requires the building of analytic models which incorporate desired predictive capabilities. Appropriate computer models for business situations may eventually provide the potentiality of on-line management control systems.

Use of Formalized System Training

In the course of developing major new military systems, it has been found that provision for training people in the on-going operations of the new systems is needed. The training in a system such as SAGE involves elaborate simulations of a predicted attack environment. This represents a new concept to the management world. The justification for this elaborate training stems from the fact that there is no other way to adequately train the people to perform under an attack situation.

However, a significant additional value in this approach should be pointed out. The proficiency of a system is determined by its operation as a whole, involving the communications and interrelations of many people and machines. Therefore, the proficiency of individual acts must be judged by measures appropriate to the system context.

It would hardly be desirable to emphasize performance at one part of the system that would be detrimental to the total system performance. In short, each person should be trained to act in an optimal way from the total system point of view.

Therefore, to adequately provide for proper performance in such broad systems, a comprehensive means of training using simulated exercises is required. Furthermore, the need for this training is not dependent on whether the environment is real or hypothetical.

Simulation Models Essential

It appears that when radically new concepts in management control are installed, quite likely simulation models will be required. The installation time, the acceptance, and therefore even the ultimate efficiency attainable by the control systems will be considerably enhanced by appropriately designed simulation exercises along with proper criteria for measuring performance in relation to the total system.

Using a systematic design approach, as shown in the preceding discussion, it is possible to develop improved, total, computer-based management control systems. In view of the requirements of current air defense systems, the need for computer-based systems was readily justified. However, industrial systems have not reached the point where objectives can be set forth in clear and unequivocal terms and thus it is difficult to evaluate a given system design.

In short, the only feasible means for meeting the military requirements for rapid, high volume, and accurate data handling was the use of computer systems. Given these requirements, one could systematically design a feasible system. On the other hand, the capability of rigorous evaluation of a number of alternative designs has generally been considered too costly. However, the acceptability of the military approach for the business world will undoubtedly be predicated on the ability

to evaluate control concepts prior to actually installing new systems.

If the advantages of information recentralization are to be achieved in practice, they must first be proved beneficial to the organization; and secondly, they must be both desired by and acceptable to management.

In practice, however, these two requirements are often in conflict. Although it is difficult to assess the value of a new system, it appears desirable to develop a design approach that is both evaluative and instructive. Such an approach can be instrumental in the realization of promised benefits of an integrated management information system. An approach which appears to be the most suitable, and perhaps the most effective in the long range, is the use of computer simulation.

Computer Simulation

As a problem-solving tool, computer simulation has been used for a number of years. It has enabled management to experiment with and test certain types of policies, procedures and organizational changes in much the same way an engineer tests new designs. With the use of computers and the development of probability methods, computer simulation can also be applied to complex operating plans or management controlling systems in addition to day-to-day operating problems. The method is similar to war gaming techniques used by the military and the paper and pencil techniques used by systems and procedure specialists.

In a sense, simulation is a synthetic means used to imitate the behavior of a system for the purpose of studying the response to specific changes. Where the problem is entirely physical in nature, such as in testing aircraft, a physical model can be used. However, in studying management control systems, which deal with the flow of information and decision networks, an exact analogue of the problem may not be possible.

An approximation, usually in the form of a mathematical or symbolic model, is used which describes the elements and properties of the system under study. Thus, a model for a management control system is a means for providing a formalized statement of system behavior, rather than a physical analogue of the system.

A Design Tool

Simulation has only recently been considered as a useful tool for the design of management control systems.[5] A similar approach has been taken in the research program conducted by the authors,[6] where computer simulation is used as a laboratory for examining system behavior. To conduct such experimentation, an analytic model of a total business system has been developed which explicitly characterizes the information flow, decision rules and physical processes of a business system.

To the extent that this model describes the behavior of the elements of the system in a realistic manner, the conclusions drawn should prove useful in the design of management controls as applied to large-scale, complex organizations and their associated information processing.

However, in view of the intricately complex nature of a total business system, intuition alone cannot be considered sufficient to evaluate new concepts or designs. While on the other hand, extensive experimentation directly in an actual plant to evaluate alternate designs poses almost insurmountable problems.

Aside from the inevitable disruptions and possibly unrealistic results, valuable time would be lost in gathering performance data. In addition, costly mistakes might result if the consequences of actually carrying out a given experiment cannot be predicted in advance, and there is no control. These considerations, therefore, strongly support the use of computer simulation both as a research and design vehicle.

Experiments with Models

Research in Management Controls implies experimentation; however, the manner of experimenting is dependent upon the results desired. An exploratory type of experimentation is possible by simply changing parameters of the simulation model and observing the resultant system behavior.

Thus, insights into the response characteristics of the system are obtained by examining the results shown in the computer output. Another manner of experimentation is to specify given system designs and subject these to many conditions and observe the effects. This latter method is principally used to test the significant differences among alternative designs.

"Policy Laboratory"

Since the computer output provides a summarization of information reflecting system behavior generated during simulation, it is possible to obtain a continuous time trace of the changes in system performance and the interdependencies among the elements of the system. It is this capability of being able to examine, in considerable detail, the changes which result from alternate system designs that has led to the term "policy laboratory" being applied to computer simulation.

The Model and its Role

To simulate management controls, then, it is necessary to have a model which provides a formal statement of the business system's behavior. Computer simulation, however, is seldom an exact analogue of the operation of an actual system. Rather, simulation performed on a digital computer can only approximate continuous, simultaneous activity. If the elements and properties of the system have been properly defined, then the parameters and variables can be readily controlled and measured.

The model may be symbolic, mathematical, or descriptive; however, it should be constructed so as to include properties which are sufficient to define the behavior of the system.

Forcing Function

The variables describe behavior for a given set of parameters. The forcing functions provide the external stimuli which cause the system to react—for example, orders which enter a system cause men to work, machines to run, and so on. In this way, orders become a forcing function for the system. Whatever particular form is used, a model provides the frame of reference within which the problem is considered.

A model often indicates relationships which are not otherwise obvious. However, it should be noted that a model need not duplicate actual conditions to be useful. A model should be designed to predict actual behavior resulting from changes in the system design or application of new decision rules. Such prediction implies an understanding of the manner in which the system reacts; that is, being able to specify the outputs for a given set of

inputs. This approach differs from the conventional concept of treating the system as a "black box."

Since a simulation model is merely a means for testing new ideas, the simpler the model, the more effective for research or design purposes. It is not necessary to incorporate all possible aspects of system behavior in the model; rather, only those variables which contribute substantially to system response characteristics need be incorporated.

To this end, a model can be considered as an initial experiment to determine what factors are most significant in a business system. The model can be refined or expanded as experimental data describing the system performance and sensitivity to various factors become available.

Developing a Business Model

For the purpose of studying management controls, modeling should be centered about the information, decision-making and control aspects of the business. The majority of simulations to date, however, have been concerned with the physical activities within a business, such as scheduling of products,[7] control of inventory, movement of vehicles, and maintenance of aircraft, to name a few.[8]

On the other hand, since management control is concerned with the more intangible aspects of the business, modeling is a far more difficult problem.[9] Reviewing some of these modeling considerations in detail indicates the task involved:

Decision-Making Process

If the decisions in an organization are associated with the physical points where they occur, then the decision-making process can be characterized by the decision rules and associated information. Interlinkages among the decision points represent the communication channels.

To simulate an organization with an appropriate degree of reality, it is necessary to establish a suitable communication network. In addition, the many decision criteria and decision rules have to be stated analytically to be amenable to computer programming.

Queuing Effects

If a decision maker is viewed as a processor of information, the rate of arrival of information and the time taken to process decisions will result in an average delay or queuing effect. Analysis of such delays will provide one important measure of system effectiveness.

The speed of information transmission, as well as the number of decision points, however, must be closely coupled with the capability of the system to respond to varying inputs. By assigning costs to alternate means of information transmittal, the cost of on-line controls can be assessed.

Organizational Considerations

Since delays in decisions are a function of information flow and queuing, they have a direct effect on the organization structure. For example, introducing alternate decision channels to permit more effective information flow might lead to radical changes in an organization. A simulation model could thus examine different forms of organization structure and evaluate the effect of changes on the system performance.

Decentralization in an organization leads to the possibility of distortion in information due to the number of

levels through which the information must pass; whereas this effect may be avoided in a more centralized organization. Therefore, the modeling must treat with this consideration in order to provide a suitable basis for studying management control systems.

Uses of the Computer Model

Up to this point, the discussion has been primarily concerned with the modeling process itself. Let us now turn to some of the specific problems which can be studied using such a simulation model.

Principles of System Design

An important consideration in management control is the relationship of the total business system to the control methodology employed. In a sense, management controls are embedded in the broader consideration of total system design.

In view of the sparsity of knowledge in this area, computer simulation provides a means for examining a multitude of alternate designs with the possibility of developing basic design principles.

Testing System Objectives

As has already been discussed, the formalizing of business objectives is probably one of the most difficult aspects in establishing useful management controls. This aspect of the problem is particularly important since there are a number of competing objectives in any system which must be taken into account to avoid suboptimization.

Using a computer model, the possible consequences of different combinations of objectives can be examined. It is evident that there may not be a set of universal objectives which apply to all businesses; rather, actual objectives are generally dependent upon the willingness of managers to take action in the face of uncertainty and with inadequate information.

Measuring System Performance

During the course of running a computer model, a means for explicit measurement of system performance must be provided. In actual practice, methods of measurement have involved long delays from occurrence to reporting of events due to the lack of high-speed data-processing equipment. However, with the increased use of computers, processing and summarizing data will prove a less formidable task, and measures of system performance can be based on actual operations.

Using fast simulation as discussed for the SAGE system, managers will have the option of periodically introducing real-time control. In addition, using a simulation model new measures of performance can be developed and tested.

Design of Management Controls

A number of design concepts that should be explored in the development of new management control systems are:

- The use of information feedback loops, providing on-line control;
- The use of variable control limits in place of arbitrary standards as the basis for corrective action;
- Inclusion of formalized decision rules in the control system to (a) provide for optimization of the business system, (b) provide for improved response characteristics of the system;
- Use of a sampled-data approach for providing information on sys-

tem performance. This is similar to the "exception principle."

Although these four items do not constitute an exhaustive list of all considerations, they do provide some idea of the complexity of designing management control systems.

All too often, management controls are treated as ends in themselves rather than as the means of improving total system performance. In the case of corporate budgeting, for example, funds may be spent unnecessarily to forestall budget cuts at a later date.

Another illustration of the misuse of the control concept is traditional costing practices that force the business to conform to arbitrary standards. As stated by Warren Alberts of United Airlines,[10] controls should be considered as guides for obtaining improved performance and not as a means of restricting performance.

If the design process, as discussed here, is at the system level, there is greater assurance that management controls will truly be integrated. The process of modeling and formalizing the structure of the business system should itself bring clarity to the interdependency of management control with planning, policies, objectives, and decision rules. As our understanding of the behavior of business systems improves, we should be in a position to develop effective design principles for management control systems.

REFERENCES

1. A. J. Rowe, "A Research Approach in Management Controls," *Journal of Industrial Engineering*, May–June 1960, Vol. XI, pp. 251–258.

2. A computerized air defense system using data automatically correlated with known flight plans to detect presence of unknown aircraft. Also provides automatic guidance of interceptors.

3. H. Simon, "The Corporation: Will It Be Managed by Machines?" *Management Review*, Nov., 1960.

4. D. G. Malcolm, J. H. Roseboom, C. E. Clark, W. Fazar, "Application of a Technique for Research and Development Program Evaluation," *Operations Research*, Vol. 7, September–October 1959, pp. 646–669.

5. D. G. Malcolm, "A Bibliography on the Use of Simulation in Management Analysis," *Operations Research*, March–April 1960, Vol. 8, pp. 169–177.

6. *System Simulation Symposium Proceedings*, American Institute of Industrial Engineers, New York, May 16–17, 1957.

7. D. G. Malcolm and A. J. Rowe, *Management Control Systems*, the proceedings of a symposium held at System Development Corporation, John Wiley, 1960.

8. A. J. Rowe, "Toward a Theory of Scheduling," *Journal of Industrial Engineering*, March–April 1960, Vol. II, pp. 125–136.

9. C. W. Cragin, et al., "Simulation: Management's Laboratory," Simulation Associates, Bradford, Mass., April 1959.

10. W. E. Alberts, "The Concepts of Management Control," *Management Control Systems*. New York, Wiley, 1960, p. 14.

Why does Great Britain have only 25 percent as many strikes as the United States? Possibly, this article suggests, because the government pursues a hands-off policy in regard to labor contracts, and restraint and responsibility characterize negotiations between unions and employers.

FREDERIC MEYERS

LABOR RELATIONS IN BRITAIN

A vast number of strange and different way of doing the same things he has been doing all his business life face the American businessman when he considers placing productive facilities in a foreign country. Impatience with these can often lead either to the abandonment of a possibly profitable venture or to failure to do as well as anticipated.

This paper will describe briefly one set of institutions in one country—labor relations in Great Britain. The experience of many United States firms long established there indicates that effective techniques of labor relations can be learned. On the other hand, some new firms have experienced un-

---

The author, Professor of Personnel Management and Industrial Relations at the University of California, Los Angeles since 1958 and a frequent arbitrator of industrial disputes, spent the past year abroad as a Guggenheim Foundation Fellow studying and surveying various aspects of industrial relations in Britain and France.

necessary difficulties in trying to transpose policies workable in the United States into an environment in which they are nearly incomprehensible.

It is sometimes said that the United States and Britain are separated by the barrier of a common language. One might broaden this to describe the barrier as the common origin of many social, economic, and legal institutions, then narrow it for present purposes to a common origin of the institutions of trade unionism and collective bargaining. But from these common origins, paths have diverged so that present practices and philosophies differ considerably.

Philosophy of Public Policy

The common beginnings of modern labor relations came around the turn of the 19th century when, in both countries, journeymen craftsmen grouped themselves for the purposes of obtaining better wages from the masters, their employers. In both countries the law dealt with them harshly, treating their young unions as criminal conspiracies.

The doctrine of conspiracy as applied in both countries was derived from English common law. In Britain a statute was enacted in 1799 with the same restrictive purpose; in the United States, no federal statutes dealing generally with labor relations appeared until more than a hundred years later.

From the public policy point of view, the divergence began with a series of Acts of Parliament beginning in 1824 which were intended to remove trade union and labor relations affairs from judicial intervention. The dominant British view had, by the early part of the twentieth century, become that expressed by Sir Winston Churchill in 1911:—"It is not good for trade unions that they should be brought in contact with the courts, and it is not good for the courts."[1]

Indeed, if Sir Winston had said that it was neither good for employers nor the courts that they be brought into contact with each other, so far as labor relations affairs are concerned, he would have expressed an equally well accepted British view.

British Unions Can't Be Sued

The effect of the long series of statutes passed in Britain between 1824 and 1913 was to remove combinations of workers from the burden of the law of criminal combination and of the tort of conspiracy, so that, for all practical purposes, nothing that could be done lawfully by an individual was either criminally or civilly actionable when done in concert.

With few exceptions, of no general interest to employers, British unions cannot be sued. Not only is this true because of specific statutory enactment; it also results from the fact that the collective bargaining agreement has no status in law at all—it is nothing more nor less than a gentlemen's agreement unrecognized by the courts.

It follows, of course, that employers are not liable at law to observe the terms of collective agreements—they are simply under a moral obligation to offer terms not less favorable than those of the collective agreement to each of their employees.

Furthermore, employers are, at law, completely free to hire, fire and place employees as they wish. They may lawfully discriminate against employees by reason of their union or political affiliation, or for any other reason they choose. It is only their conscience or pressure from organized employees that prevents them from doing so.

Collective Laissez-faire

This approach of complete legal nonintervention in labor relations matters, or "collective laissez-faire" as it has been called,[2] contrasts with the American approach. Over the century and a half during which the British used the statutory process to get labor relations away from the law, we first allowed the courts gradually to develop common law rights and obligations, then to develop applications of statutory antitrust law to employee-employer relations.

In the last phase, beginning with the Norris-LaGuardia and Wagner Acts and carrying through the Taft-Hartley Act and its several amendments, we have carefully regulated most aspects of labor relations, creating a maze of rights and duties of unions, employees, and employers enforceable in the courts. The collective agreement has become a contract, however different from others, which both parties must observe at risk of legal sanction.

It would be wholly fruitless to attempt a comparative evaluation of these two approaches to the problems of labor relations. Each is embedded in a social and economic structure which it complements and expresses. But these structures and the legal systems which they produced have resulted in quite different contemporary ways of doing things.

Structure of British Unions

The British labor movement, having grown more rapidly in the earlier years and more consistently until relatively recently, developed and retained much more highly varied structural forms. Unlike the United States labor movement, it has been free of legal restraints and pressures, such as those of external determinations of bargaining units and the doctrine of exclusive representation which might have served to "rationalize" their structures.

British unions range from small craft unions whose membership may be wholly within a small geographic area, to giant "general unions" composed largely of unskilled and semi-skilled workers (and some skilled workers) in almost every industry anywhere. Certain of the national craft unions, such as the Amalgamated Engineering (Machinists) Union and the Electrical Trades Union have undergone structural changes paralleling those of some United States craft unions, for example, the International Association of Machinists. Beginning many years ago as craft unions of journeymen, the machinists expanded their jurisdictions as the nature of their work changed. Now its membership includes many lesser skilled workers.

Industrial Unions Slow to Emerge

A major structural difference as compared with the United States is the relatively slow development of industrial unions. Of the fifteen largest British unions, including all unions with membership of over 100,000[3] only two, the National Union of Mineworkers and the Iron and Steel Union, are industrial in structure. Two of the four largest are the great "general unions," the Transport and General Workers and the National Union of General and Municipal Workers.

In the vast and sprawling engineering (metal working) industry, thirty-one unions belong to the Confederation of Shipbuilding and Engineering Unions which bargains with the Employers Federation for the industry. Six additional unions are parties to the agreement setting up a disputes settle-

ment procedure.[4] Many of these unions have overlapping jurisdictions, and competing claims for recognition or work assignment are not susceptible to legal solutions as they may be in the United States.

Work assignment disputes are not unusual in Great Britain, though despite the lack of legal sanction they result in less lost time per worker than in the United States.[5] A recent example was a stubborn strike of electricians at a glass factory provoked by the action of a crane driver in removing, contrary to the written instructions of his employer, the inspection cover on an electric crane, the work of an electrician.[6]

The employer must rely on the self-discipline of the labor movement to minimize these problems. While this may seem a weak resource, it is the only one, and, indeed as the strike statistics might suggest, a not altogether ineffective one.

Structure of Bargaining

While industrial unionism is relatively rare in Britain, collective bargaining is largely based on national agreements negotiated between federations of employers and groups of unions in an industry or groups of closely related industries. The problem of union recognition, then, takes somewhat different form than that in the United States.

An "organized" employer is one who recognizes his obligation to abide by the terms of nationally negotiated agreements and to recognize the applicability to him of disputes settlement procedures contained in them. Pressure may be brought on the unorganized employer by a particular union claiming membership among his employees, yet when negotiation takes place, numerous unions may participate in the national settlement.

Recognition, then, confers no exclusive right to representation on the part of a single union. It generally means participation through the agency of an employer federation in national negotiations, the recognition of the right of representatives of unions to negotiate grievances and the application of national agreements to the particular situation.

Under these circumstances, the majority or minority status of the union among the particular employees of a particular employer has much less meaning than in the United States, at least so far as recognition is concerned. And since union recognition means participation in an established national machinery, the problem of which union to recognize is not, to the new employer, often a relevant one.[7]

TUC Against Closed Shops

Because of the structure of British unionism, collective bargaining practices in most industries do not lend themsleves well to the rigid application of the several kinds of union security agreements often found in United States industry. The official position of the Trades Union Congress, the AFL-CIO of the British labor movement, is in opposition to the closed or union shop, defined as Americans would define them, but in favor of "100% organization." By this is meant a situation in which all employees of the relevant employer belong to some union, though not necessarily to the same one. The employer may be called upon to help enforce 100% unionism in the various unions involved.

Occasional examples of United States style union shops do exist, how-

ever, and within what would be called in the United States a craft "bargaining unit" or occasionally when inter-union agreement assigns jurisdiction over an entire plant to one union, strong sentiment will exist that the workers should all belong to the "right" union. Thus, workers may "send to Coventry," that is completely isolate, a nonunionist or adherent of the "wrong" union or such a situation may provoke a strike.

Perhaps the most stubborn though infrequent problems arise with "breakaway" unions, groups dissatisfied with the administration of the union with which they have been affiliated, and which break away to form new ones. If the original union was affiliated with TUC, the rebel group may find the whole force of the labor movement arrayed against it. The employer of members of the breakaway union may find himself greatly embarassed and with few means to help himself out of the dilemma.

Settlement of Disputes

Bargaining about basic minimum wages and certain conditions of work is typically carried on at the national level between the employers federation and the recognized unions in an industry. Aside from their nonenforceability at law, these basic agreements differ in major respects even from such national agreements as prevail in the United States.

In the first place, they are typically a compendium of agreements ordinarily reached at various times extending over many years, each of which runs until one or the other party seeks to modify it. Included in this compendium will be the "procedure agreement" which defines the agreed method of disputes settlement.

British industrial relations practice knows no sharp distinction between disputes over "rights" and those over "interests." A dispute is to be settled by the agreed procedure, whether or not it is a question of application or interpretation of an existing agreement, or a problem of a proposed change in the system of agreements.

A typical disputes settlement procedure would provide that a question arising at shop level be dealt with first at that level between local management, the worker if an individual grievance, and shop stewards or works committeemen, assisted possibly by a union official and a representative of the employers federation.

Both Sides Rely on Good Faith

Failing agreement there, the dispute would be referred to a standing regional conference of employer and union representatives, on which the affected employer is represented only as a member of his federation. Failure there will result in referral to a standing national conference similarly composed. The standing national body will of course have original jurisdiction over proposed changes in national wage or working conditions agreements.

No strike or lockout clauses are ordinarily operative until this procedure is exhausted. Agreement to refer future disputes to final and binding arbitration is rare. In any event, the procedure itself, the no-strike clause, and any possible agreement to refer to arbitration has no more legally binding force than the collective agreement incorporating them. They all depend upon the good faith and self-discipline of the parties involved.

In addition to the agreed disputes settlement procedure national agree-

ments typically cover a rather limited group of substantive provisions dealing with wages and basic conditions of work—hours and overtime premiums, vacations and the like. Complex seniority rules, provisions governing discipline, promotion, or complex fringe benefits rarely appear in British national agreements.

Fringe Benefits Ignored

There are a variety of reasons for the limited scope of national agreements. As to the sophisticated fringe benefit schemes which have become such a large part of United States practice, the attitude of British unions has traditionally been that the risks that they often anticipate are problems better dealt with by national social security legislation. This attitude is changing, but only slowly. Thus, British unions have not generally been interested in negotiating pension plans, supplemental unemployment benefits, sick pay schemes and the like.

This does not mean that no such schemes exist. Many firms have developed a wide variety of them. But they are almost never nationally negotiated, and often have been the subject of little or no negotiation at the plant or firm level. Typically they are instituted unilaterally by management, often with at best the assent of a union which played no part in the development of the plan.

Other gaps in the scope of national agreements are filled in by a complex of local custom which assumes the force of agreement, or understanding incorporating the implied assent of the unions to a practice instituted unilaterally by management, and of locally negotiated agreements on particular matters. An agreement is made up of all these components.

Unwritten Benefits Rely on Custom

Many of these rules are unwritten, existing only in the memories of workpeople, union representatives and local management. But few acts of management can create more difficulty than to change a traditional practice without prior consultation and agreement with shop stewards or local union officials.

The scope of matters bargained about in Britain is probably narrower than that in the United States. For example, there are rarely well formulated rules on discipline and discharge. Such rules as exist about order of layoff are quite imprecise and leave much wider latitude to management than their counterparts in the United States.

They may provide simply for consultation with shop stewards in the establishment of a layoff list based on the criteria of relative efficiency, seniority and the financial situation of the workers. An almost universal corollary of the last is that married women go first. Again, within the limits of craft jurisdiction and union membership, managements are relatively more free in Britain to transfer or promote without the prescription of collectively bargained rules.

Relations at the Plant Level

These freedoms from collectively bargained restraints are not, from a managerial point of view, entirely positive aspects of the British industrial relations picture. The fact that British unions have traditionally sought rather limited goals from collective bargaining does not imply that British workers do not seek much the same goals from their work. And when the attainment of these goals is frustrated by unilateral managerial action, management will likely hear from its

employees in one (or several) of the many British accents the words which must haunt the bad dreams of many a personnel manager. "We're not having that." And often they don't.

The institution of national bargaining grew in Britain partly out of the egalitarian ideals of the British labor movement, seeking the establishment of a "common rule" throughout an industry or craft. Most British employers are as firmly attached to the principle of national bargaining as are trade unionists, though occasional cases of firms which insist on bargaining separately do exist—some or most of them being large and important enterprises.

British Unions Less Ruthless

The nature of national bargaining is such that its scope must be limited; detailed rules other than basic wages and hours often must be designed for the particular plant. Furthermore, in a period of sustained prosperity and tight labor markets, nationally bargained minimums have often become increasingly unreal. British unions have been much less ruthless than American and have pitched their national goals far lower than the general economic circumstances of an industry might perhaps permit, allowing the survival of many "marginal" enterprises.

Employees and their shop stewards in the prosperous firms are fully aware of the bargaining position that prosperity and a tight labor market create. Indeed even in the absence of local union pressure, employers often voluntarily pay substantially more than the bargained rates. I was told by a prominent employer in one small industry that what looked like an exceedingly large union wage demand would, if granted, have affected directly only about three percent of the workers in the industry throughout England.

The gaps left by national bargaining and the opportunities created by prosperity have greatly stimulated action at the plant level. Leadership has, rather naturally, been assumed by shop stewards of the several unions which may exist side by side in a plant. Shop stewards organizations extending beyond the bounds of single plant or union have appeared.

Communists Exploit Some Stewards

Communism is still a significant influence in portions of the British labor movement, and some British observers have attributed much of the ferment at the plant level to Communist agitation. It is true that the Communist-led unions, such as the Electrical Trade Union are virtually alone in giving unstinted support to their stewards, to demands formulated at plant level and to action of any kind to achieve them.

Much of the labor movement and its official hierarchy is extremely wary of the assumption of responsibility or power by stewards acting outside the scope of national agreements. They are quite adamant in opposition to the unofficial shop stewards organizations which, in their view, usurp the functions of union officials and the several official associations of unions formed for bargaining within an industry.

Some few unions have been able to control and guide this natural pressure from below. Another few, the Communist-led have actively promoted it. But many have been unable to forsake their attachment to limited national bargaining, legislative and socialist goals, even in the face of membership pressure to make the best of what, at the moment for many of them, is a relatively attractive capitalist world.

Workers in prosperous firms see no reason for this restraint. Communists, where they exist, have been able, paradoxically, to capitalize on the failure of traditional unionsm to cope with capitalist prosperity. But the ferment would exist without them.

A big problem, then, of current British labor relations is the development of autonomous local action uncontrolled by official union leadership, and still apparently uncontrollable though TUC has recently in convention advocated action. And British management is divided about whether to attempt to come to terms with plant level organization or to stick to older institutions.

Neither unions nor management are likely to be able to deal with the problem merely by the exercise of sanctions. Unions can only expel members, or disqualify stewards or others from holding union office. Such devices are effective only when the offense giving rise to the discipline is recognized by much of the membership as contrary to the interest of the union and its members. But there are, as we have said, real reasons for the unrest at plant level.

Management has little in the way of legal sanctions. There is nothing unlawful about a strike over trade matters. Unions cannot be called legally to account for them, despite any no-strike agreements. The typical contract between an employer and his individual employees contains, implicitly or explicitly, a requirement to give notice, usually ranging around a week for manual workers, before termination.

Technically, a striker who has not given due notice before he ceases work is in breach of his contract and may be sued. But it is the individual employee who is liable, and few British employers have considered it wise to sue their employees. The only significant exception is the National Coal Board, operating the nationalized coal mines, which has at times sued wildcat strikers. Where the strike has the support of substantial numbers of workpeople, more long run damage is done by suits than can be gained.

Employers are, of course, quite free legally to dismiss employees who strike or lead strikes or disrupt the life of the plant. Indeed, giving the proper notice, they may dismiss empolyees for any or no reason. But British workers are extremely sensitive to what may be regarded as "victimization."

According to a recent TUC study,[11] dismissals were nearly as important as money issues as the precipitating causes of wildcat strikes.

75% Less Strikes Than U. S.

Despite the greater legal and contractual right of British employers to dismiss, one gets the sense that they are much more reluctant to exercise this right than are American employers who typically operate under greater formal constraints. One reason is, no doubt, the fear of adverse employee reaction, not necessarily limited to an outright strike.

Emphasis on these problems should not obscure the fact that the British record for industrial peace is far better than that of the United States—Britain loses a much smaller proportion of available man hours of work through strikes than does the United States—around twenty or twenty-five percent as much.[12]

But the circumstances in which strikes do occur, and the issues giving rise to them differ significantly from those in the United States. Most strikes

are shorter, less predictable and involve fewer employees. The British employer cannot sign an agreement for a definite term and be reasonably assured of strike-free operation until its expiration.

White Collar Workers Unionized

The philosophy of "collective laissez-faire" in Britain implies as a corollary that there will be no intervention in matters concerning organization of employees whatever their industrial status. It is, therefore, perfectly permissible not only for white collar workers but for technical scientific and supervisory workers to join unions and bargain collectively.

The proportion of white collar workers in effective unions in Britain far exceeds that in the United States, but much of the difference is accounted for by organizations of government employees and of teachers, virtually all of whom are in strong unions. Among employees of the National Coal Board, supervisory employees, including mine managers and even higher levels of management bargain collectively.

Save for the employees of cooperative wholesale and retail establishments, British unions have had only moderately better success in organizing commercial and financial employees than have American unions. A good many "staff associations" or company unions have been fostered by banks and other financial institutions. As for white collar, technical and supervisory workers in industry, rather extensive recognition and bargaining exists.

In the engineering industry, for example, national agreements exist for clerical workers to which three unions and the employers federation are party. Limited recognition is given to the Association of Supervisory Staff Executives and Technicians for supervisory workers, to the Association of Scientific Workers for nonsupervisory technicians and to a draughtsmen's union.

In the British industrial culture, union membership and the demand to bargain collectively among such workers does not have quite the same connotation of "disloyalty" which so many United States employers attribute to it. The employer who openly opposes organization of these types of employees would find little public support for his position. The relatively modest extent of organization is probably due more to the disinterest of the employees, particularly in a period of shortages of qualified personnel, and to distaste for the political aims of the labor movement[13] than to any generally felt sense that unionism for them is inappropriate.

Joint Consultation

Two aspects of British industrial relations practice peripheral to labor relations and collective bargaining deserve at least some mention in this description. The first is the practice of "joint consultation." The ideological antecedents of joint consultation are varied, ranging from syndicalism to Catholic social thought. Several of these philosophical streams converge in the notion of achieving industrial democracy through some element of worker participation in management.

In Britain, the recommendations of the Whitley Commission after the first World War and the development of various forms of joint production committees during the second served to keep the idea alive. In the nationalized industries statutory provision is made for joint consultation. The idea still

prevails widely in Britain, particularly among professional personnel managers and some segments of the labor movement.[14]

Joint consultation must, in the British view, be carried on side by side with collective bargaining; under no circumstances can it serve as an alternative. The subject matter of joint consultation is conceived to be that which is not ordinarily dealt with in collective bargaining.

It may include such matters as health and safety, productivity, planning for technological change, canteens or other welfare activities of the firm—in general, matters other than wages and conditions of work. It is carried on through committees on which workers are represented by elected members, often union functionaries, and almost invariably union membership is a requisite to service.

Assessments of the value and success of joint consultation vary. To many managements its most useful aspect is as a link in the chain of communication, rather than as a device to admit workers to any effective voice in management. Those managements which find it useful for the former purpose, of course, limit the authority of joint consultative committees rather strictly to the reception and discussion of managerial decisions already largely committed.

This view conflicts with the trade union view sometimes held that its function is as a step toward co-management. These conflicts in concept, and the almost inevitable tendency either to use the joint consultative machinery as a second bargaining device, or to transfer all really significant matters away from it to the established bargaining machinery, account in large part for the decline in importance of joint consultation at least since 1950. It still remains, however, as an institution to which much verbal importance is attached and for which a great many firms have established machinery to insure its maintenance.

Wages Councils

The second institution is quite limited in scope and deserves only the briefest mention here. It is the Wages Council, which has a statutory base in Acts in Parliament. The function of a Wages Council is to establish minimum wages in an industry in which normal negotiating (bargaining) machinery is inadequate or does not exist and which is considered to require wage regulation. Britain has no statute setting a national minimum wage.

Wages Councils are established by order of the Minister of Labour, and are tripartite in character, including representatives nominated by employer and worker organizations. They recommend minimum wages for the industry, and sometimes certain other money conditions of employment. These are occupational minima, rather than a single floor under all wage rates. These, by order of the Minister, become law. For the purpose of this description, it is to be noted only that where collective bargaining has not developed, unions and employer representatives participate in the establishment of legal minimum wages, if the Government decides that any legal minimum shall be established.

Public Accepts Unions

The price of the maintenance of governmental non-intervention in Britain has been the development of responsibility on both sides of industry. British industrial relations have had their periods of great turmoil, though

they have been less frequent and less tumultuous than those in the United States. But it is no longer fashionable, if it ever was in Britain, to deprecate the development of strong unions and the institutions of bargaining.

There are, of course, criticisms of and vehement opposition to the official Socialist political goals of the labor movement, and great concern about Communist leadership in some unions. Though it must be noted that even the latter does not suggest to anyone of importance in Britain the desirability of statutory control, nor, at least publicly, of discrimination in employment on grounds of Communist sympathy or membership. There is grumbling about some industrial practices of unions, and great discontent with the inability or unwillingness of the movement to maintain greater discipline in the plants. But the institutions of unionism and bargaining have massive public support.

Restraint and Responsibility

The temperate acceptance of trade unionism among British employers is perhaps brought home by the role usually played by the personnel manager. A bit of the flavor may be indicated by the fact that academic training of personnel managers grew up first in Departments of Social Science whose primary function was to train professional social workers.

Personnel management is becoming, in Britain, a highly developed profession with growing insistence on the maintenance of professional standards and codes. Among these is the basic concept that a major function of the personnel department is primarily to serve as a mediating influence between unions and executives.

This is not, among leading personnel people in Britain, a mere formalism; it is a doctrine which they carry into their jobs. The executive cannot expect from his personnel manager blind and rigid adherence to predetermined managerial policy. He will find an insistence upon the introduction of concepts of social equity into the making of business decisions.

As this relatively new force gradually replaces the idealistic paternalism of some of the leading firms of the nineteenth and early twentieth centuries, one hopes it may help contribute to British management that continuing and even broader degree of restraint and responsibility in the conduct of labor relations which is necessary to the maintenance of the tradition of voluntarism and governmental restraint which is virtually unique and which is one of the most admirable aspects of British industrial society.

REFERENCES

(The author gratefully acknowledges his indebtedness to the Guggenheim Foundation, the UCLA Business Research Associates, the UCLA Institute of Industrial Relations, and the Fund for the Republic which contributed to a year's European research into various aspects of industrial relations.)

1. Otto Kahn-Freund, *Labour Law* (London, Stevens and Sons Ltd., no date) (1958?), p. 232.

2. See note 1.

3. Report of the Chief Registrar of Friendly Societies, Part 4, Trade Unions, 1958 (London, Her Majesty's Stationery Office, 1959).

4. Handbook of National Agreements, Engineering Industry (London, Confederation of Shipbuilding and Engineering Unions, 1958).

5. See *Ministry of Labour Review*, and *Monthly Labor Review*.

6. *The Times* (London, May 17, 1960).

7. Though "poaching," that is recruiting members among workers already belonging to another union, is an internal problem of at least some significance, it is dealt with in some inter-union agreements and by TUC adjudication.

8. The government provides aids to dispute settlement to which parties have access.

9. Some shop steward organizations have been company or industry wide, as in the British Motors Company and in the generation of electrical power. One national organization, the Engineering and Allied Trades Shop Stewards Council, claims members in several industries. Of the BMC and electricity type of organization, the General Council of TUC recently said: "Whatever the motive of those primarily responsible . . . the effect is often a challenge to established union arrangements. For some years, it has been a policy of disruptive political bodies to form national organizations of shop stewards . . ."

Of the Engineering and Allied Trades organization, the General Council said: "The aim of the sponsors . . . is to usurp the policy-making functions of unions or federations of unions. Unions are advised to inform their members that participation in such bodies is contrary to the obligations of union membership." *General Council's Report*, 1960, p. 41.

10. The extent of Communist influence is, of course, difficult to measure. The Electrical Trades Union, with about a quarter of a million members, is the biggest union whose Executive Council is Communist controlled. The Amalgamated Engineering Union and the National Union of Mineworkers have significant Communist minorities in their national membership. Certain other smaller unions have open Communist domination or influence in their national executive bodies.

Throughout the British labor movement, however, Communists are a small minority. Some unions, for example, the Transport and General Workers, Britain's largest, disqualify Communists from holding office. The Trades Union Congress has demanded an investigation into charges of corruption in the election of a Communist to national office in the Electrical Trade Union. There is widespread concern in and out of the labor movement with the problem.

11. See Report of Trades Union Congress, Douglas (Isle of Man), Sept., 1960.

12. Statistics computed comparably are hard to obtain. Among the most recent comparisons are those in: *International Labor Review*, July, 1955, "Industrial Disputes, 1937–1954." These show that, for the period covered, 1954 was the postwar year in which the United States compared most favorably with the United Kingdom. In that year, we lost 850 work days per thousand workers in mining, manufacturing, construction, and transport, while Britain lost 190.

13. For example, 94 percent of the Association of Supervisory Staffs, Executives and Technicians "contract out" of dues to the Labour Party. See *Observer* (London, October, 1960), p. 5.

IS THE SUPPLY OF URBAN LAND RUNNING OUT?

JACK LESSINGER

No cities made their own land, and, assisted by freeways and canny relocation of factories, draw nearby towns into the urban enclave. Here is how crowded, constricted San Francisco is doing it. Here, also, is a prescription to insure long run land supplies in many urban areas.

Dr. Lessinger, author of this optimistic treatment of one of the favorite topics of the prophets of doom and gloom, has been associated with the Real Estate Research Program of the Bureau of Business and Economic Research at the University of California, Berkeley for the past five years and is a contributor to various publications in the fields of land economics and sociology.

URBAN land shortages are likely to be self-imposed, more imaginary than real, or if real, unnecessary. The shortage problem would be indicated by unreasonable increases in prices for building sites due to the physical unavailability of suitable land. However, this article directs attention to the probable availability of large supplies of land in relation to short-run demands in most of the nation's metropolitan areas.

Also, it suggests that appropriate actions in metropolitan public works, e.g., freeways, bridges, rapid transit, water, sewerage supplies and many other facilities should help to bring in needed future supplies.

It must be stated at the outset that the opinions expressed here are those of the author only and do not necessarily reflect the views of the Real Estate Research Program or of the University of California with which he is associated.

The land shortage problem must be sharply differentiated from three other conditions. First, higher land prices may simply reflect general inflation in the prices of all goods. Second, land should increase in value as site-qualities improve commensurate with metropolitan growth. Third, prices may increase due to a "speculative complex."

Artificial Shortages

The general public is led to believe that the urban land supply is necessarily fixed in amount, or necessarily increases too slowly, and that observed

increases in land prices are explained by the small physical amount of land remaining. Partly as a result of this conception land supplies are held off the market in anticipation of further increases.[1]

In paying ever higher prices, buyers tacitly agree with sellers. When urbanites believe that the urban land supply is too small it becomes too small economically, even if it is physically large. Prices reflect what people think. What they think does not have to be true.

Metropolitan areas throughout the United States differ widely in the degree to which they may be subject to urban land shortages. Table I indicates the population added per acre of land supply for metropolitan areas in the 13 Census Economic Regions of the United States. The greater the population added per acre, the greater has been the presumed pressure of urban population on the land. Unfortunately, relevant 1960 data are not yet available; only the 1940–50 period can be considered.

It should be stressed that the Census permits only the grossest approximation to the concept of urban land supply. First it is necessary to assume that the boundaries of standard metropolitan areas include sites with accessibilities just high enough to be considered for urban development.

Further, it must be assumed that cropland harvested within a standard metropolitan area represents the total metropolitan supply of vacant land suitable for urbanization. Putting the two assumptions together, remote land physically unsuitable for agriculture is not counted in the urban land supply; all suitable land is presumably counted.

The two highest Regions are IX and XI (1.7 and 1.3 respectively) which include metropolitan areas in New Mexico, Texas, Utah, Florida, and Louisiana. However, scarcities in these areas are apt to be spurious since classes of land other than cropland harvested tend to be available for urbanization, sometimes in vast quantities.

Included in the urban potential are level, unirrigated, arid pasture lands and level or gently rolling pasture or woodlands in areas of moderate to high rainfall. In some cases, however, urbanization would require public investments for drainage or water supplies.

When allowances are made for Regions IX and XI, I and XIII show the greatest population pressures on the presumed land supplies. This is understandable. Region I contains some of the largest and oldest metropolitan areas on the eastern seaboard such as New York, Philadelphia, and Washington, D.C.

Region XIII includes seven large rapidly growing standard metropolitan areas in California as well as Phoenix, Arizona. Apparently pressures of new population on the land in these two Regions are roughly comparable, and far exceed pressures in most other regions.

Thus, Regions II, III, IV, V, VI, VII, VIII, and X all showed population pressures of less than .6 new individuals per acre compared to the 1.1 of I and XIII. It should be recognized that wide variations exist within Regions. Also the crudeness of the data does not permit meaningful comparisons where differences are small. Neither do the data permit any conclusion as to whether the pressure in any one place is serious enough to constitute a land shortage problem.

A definitive study of urban land supplies in the United States relative to

TABLE I

POPULATION ADDED, 1940–1950, PER ACRE OF 1949 HARVESTED CROPLAND IN STANDARD METROPOLITAN AREAS OF ECONOMIC REGIONS

Region	1 1940–1950 Population Change (in thousands)	2 1949 Harvested Cropland (in thousands) of acres	(1 ÷ 2) Presumed Population Pressures on the Land Supply
I	3,524	3,110	1.1
II	268	1,406	0.2
III	2,248	4,086	0.6
IV	213	1,008	0.2
V	853	5,197	0.2
VI	293	860	0.3
VII	821	1,477	0.6
VIII	835	1,306	0.6
IX	1,467	868	1.7
X	628	1,425	0.4
XI	203	162	1.3
XII	582	658	0.9
XIII	3,151	2,945	1.1

SOURCE: U. S. Census, collated in Donald J. Bogue, *Metropolitan Growth and the Conversion of Land to Nonagricultural Uses*. Appendix Tables II–III, pp. 28–33. Studies in Population Distribution Number 11. 1956.

Region I: Allentown-Bethlehem-Easton, Pa.; Atlantic City, N.J.; Baltimore, Md.; Boston-Lawrence-Lowell, Mass.; Bridgeport-Stamford-Norwalk, Conn.; Brockton, Mass.; Fall River-New Bedford, Mass.; Harrisburg, Pa.; Hartford-New Britain-Bristol, Conn.; Lancaster, Pa.; New Haven-Waterbury, Conn.; New York-Northeastern N.J.; Norfolk-Portsmouth, Va.; Philadelphia, Pa.; Providence, R.I ; Reading, Pa.; Springfield-Holyoke, Mass.; Trenton, N.J.; Washington, D.C.; Wilmington, Del.; Worcester, Mass.; York, Pa.

Region II: Albany-Schenectady-Troy, N.Y.; Altoona, Pa.; Binghampton, N.Y.; Buffalo, N.Y.; Manchester, N.H.; Pittsfield, Mass.; Portland, Me.; Rochester, N.Y.; Scranton, Pa.; Syracuse, N.Y.; Utica-Rome, N.Y.; Wilkes-Barre-Hazelton, Pa.

Region III: Akron, Ohio; Canton, Ohio; Chicago, Ill.; Cleveland, Ohio, Detroit, Mich.; Erie, Pa.; Flint, Mich.; Grand Rapids, Mich.; Jackson, Mich.; Johnstown, Pa.; Lansing, Mich.; Lorain-Elyria, Ohio; Milwaukee, Wisc.; Pittsburgh, Pa.; Racine, Wis.; Saginaw, Mich.; South Bend, Ind.; Toledo, Ohio; Wheeling, W. Va.; Steubenville, Ohio; Youngstown, Ohio.

Region IV: Duluth, Minn.-Superior, Wisc.; Madison, Wis.; Minneapolis-St. Paul, Minn.

Region V: Cedar Rapids, Iowa; Columbus, Ohio; Davenport, Iowa-Rock Island-Moline, Ill.; Dayton, Ohio; Des Moines, Iowa; Evansville, Ind.; Fort Wayne, Ind.; Hamilton-Middletown, Ohio; Indianapolis, Ind.; Kalamazoo, Mich.; Kansas City, Mo.; Lincoln, Neb.; Omaha, Neb.; Peoria, Ill.; Rockford, Ill.; Sioux City, Iowa; Springfield, Ohio; Terre Haute, Ind.; Topeka, Kan.; Waterloo, Iowa.

Region VI: Denver, Colo.; Tulsa, Okla.; Wichita, Kan.

Region VII: Asheville, N.C.; Charleston, W.Va.; Chattanooga, Tenn.; Cincinnati, Ohio; Huntington, W.Va.-Ashland, Ky.; Knoxville, Tenn.; Lexington, Ky.; Louisville, Ky.; Nashville, Tenn.; Roanoke, Va.; St. Louis, Mo.; Springfield, Mo.

Region VIII: Atlanta, Ga.; Augusta, Ga.; Birmingham, Ala.; Charlotte, N.C.; Columbia, S.C.; Columbus, Ga.; Durham, N.C.; Greensboro-High Point, N.C.; Greenville, S.C.; Jackson, Miss.; Macon, Ga.; Memphis, Tenn.; Montgomery, Ala.; Raleigh, N.C.; Richmond, Va.; Winston-Salem, N.C.

Region IX: Baton Rouge, La.; Beaumont-Port Arthur, Tex.; Charleston, S.C.; Corpus Christi, Tex.; Galveston, Tex.; Houston, Tex.; Jacksonville, Fla.; Miami, Fla.; Mobile, Ala.; New Orleans, La.; Orlando, Fla.; San Antonio, Tex.; Savannah, Ga.; Tampa-St. Petersburg, Fla.

Region X: Austin, Tex.; Dallas, Tex.; Fort Worth, Tex.; Little Rock-North Little Rock, Ark.; Lubbock, Tex.; Oklahoma City, Okla.; Shreveport, La.; Waco, Tex.

Region XI: Albuquerque, N.M.; El Paso, Tex.; Salt Lake City, Utah.

Region XII: Portland, Ore.; Seattle, Wash.; Spokane, Wash.; Tacoma, Wash.

Region XIII: Fresno, Calif.; Los Angeles, Calif.; Phoenix, Ariz.; Sacramento, Calif.; San Bernardino, Calif.; San Diego, Calif.; San Francisco-Oakland, Calif.; San Jose Calif.; Stockton, Calif.

demands ideally requires precise and sensitive measurements in every urban area. However, the refined kinds of data to provide needed measurements on urban land supplies are not available.

In view of this bottleneck, it will be necessary to derive an estimate by means of a sample. A careful study of some one metropolitan area having a high pressure of new population on the land supply could help delineate the land shortage problem for the bulk of the remaining areas.

It was observed that Regions I and XIII showed the highest pressures of new population on the land supply. A further breakdown indicates that the nine-county San Francisco Bay Area bears an even greater presumed pressure of population on the land than the average for either Region. It is 1.7 new individuals per acre as compared to the 1.1 average for the two highest regions.

This high comparative pressure is readily understandable. First, the area is among the most rapidly growing in the nation. Population has increased by more than 50 per cent in the last 15 years. Second, much of the land surrounding the local centers is taken up with unusable space. A large bay forms the center of the metropolitan circle. Numerous mountains and foothills intersperse the remainder. The Pacific Ocean forms an impenetrable barrier on the west.

However, while the San Francisco Bay Area represents a case of high pressure on the land supply it is by no means the highest. In Region XIII both San Diego and Los Angeles are higher. Several of the large metropolitan areas in other regions are higher too, especially in Region I, e.g., Baltimore, Boston-Lawrence, Lowell, Bridgeport-Stamford-Norwalk, New York–Northeastern New Jersey, Norfolk-Portsmouth, Providence, and Washington, D.C. Yet, to some extent other areas may appear higher only as a result of the gross criteria used.

In place of extended comparisons of all metropolitan areas, a detailed study of the San Francisco Bay Area will be made.

40-Year Land Supply Left

Close examination of the urban land supply of the San Francisco Bay Area leads to the conclusion that there is at least a 30- to 50-year supply of suitable land for urban development in the San Francisco Bay Area. This conclusion is based on the application of certain 1960 standards of urban suitability to the supply in 1960.

It is necessary to compare the inventory of land with probable demands. Not all land can be included as usable. Certainly land with marked physical defects such as swamps and mountains should be omitted. Except for land very close to urban centers, land with over 15 percent slope should be left out at this time, though in the future steeper land may be used.

We should also leave out areas which are at present too far from metropolitan employment centers including former independent nodes. Some approximations may be made from a special study by the author on San Francisco Area accessibilities which is still in process. Finally, of course, land already urbanized by 1960 must be omitted. To be on the conservative side, military reservations, regional parks, and other extensive urban uses can also be excluded. Some of these may later be converted to intensive uses.

Based upon the above assumptions, it is estimated that a total of 478,900

acres are suitable and available for urban use in the San Francisco metropolitan Bay Area at the start of 1960. This is extremely conservative, since the Department of Commerce estimates a total of 2,325,120 acres which may potentially come into use by 2020.[2]

The difference between the two estimates results from three causes. Our estimates include land with slopes only up to 15 percent while the Department of Commerce includes land with slopes up to 30 percent. We omit land relatively distant from present employment centers while they include all the land they define as suitable in San Francisco, Marin, Sonoma, Napa, Solano, Contra Costa, Alameda, Santa Clara, and San Mateo counties. Finally, different measurement procedures are used in each case.

What demands will probably be made on the 478,900 acres of suitable and available land? Two important considerations will influence probable demands: the number of people expected to arrive in the area or be born there (net of departures and deaths) in the next 30 to 50 years, and the rate at which these "new people" convert nonurban land to the various uses.

5 Million More Residents

The Bureau of the Census has made four different population forecasts for the San Francisco Bay Area based on four sets of assumptions. As a result a range of 3,110,000 to 5,409,000 additional residents has been forecast for the 30-year period 1960–90. A range of 5,592,000 to 11,154,000 has been forecast for the 50-year period 1960–2010.[3]

The best basis to estimate the rate at which these new residents will use land is the experience here over the last 15 years. Earlier experience, or experience in other areas, is not particularly relevant, and more than 15 postwar years are not yet available.

In the San Francisco Bay Area as a whole there was a net estimated increase of 1,275,600 people over the 15-year period 1945–60.[4] During the same period we estimate that 80,335 acres were converted to residential, commercial, intensive industrial and intensive public sites and streets outside of the area already built up by 1945.[5] To this may be added a rough estimate of 6,000 acres for freeways built on land potentially urbanizable.[6]

On the average, one new acre was converted outside the 1945 built-up area for every 14.7 increase in population. Does this represent the amount of suitable and available land likely to be converted in the future, in relation to population increases? Three qualifications must be taken into consideration. First, increases in extensive uses were not included. Second, conversions of land within the built-up area were not included. Third, there was a net loss of population from the central cities.

Release of Government-Held Acres

On the first score, it is likely that increases in extensive urban uses, e.g., in military installations, regional parks, quarries, etc., will probably occur on land not presently suitable and available for urban purposes, i.e., on land of greater slope than 15 percent and relatively distant from present employment centers.

Military installations occupy large acreages of excellent land for urban development. These uses represent a hangover from the past rather than rational current choice. Sooner or later a good part of this land may be released.

This should largely compensate for increases in extensive uses which require higher accessibility. However, a large part of the open-space recreational uses seek more rugged land anyway, with and without accessibility to the metropolis. This kind of land is available in great abundance in the San Francisco Bay Area.

Other factors should be considered which influence the usefulness of the ratio 14.7 people per acre. Suppose one (old) area loses 10,000 people and another (new area) gains 10,001. This is a net gain of one person, if the two areas are combined. Suppose the combined areas convert 1,000 acres to urban use.

Therefore, for the combined areas it takes 1,000 acres to accommodate one person (.001 person per acre). Apparently land is being recklessly squandered. Now, suppose we know that all the 1,000 acres converted are in the new area. Then the use of land is drastically different—almost 10 persons per acre. This is found by ignoring the losses in the old area, and considering only the gains in the new.

Notice that when you include the population losses in the old areas you decrease the number of people per acre. This was reflected in the ratio of 14.7 persons per acre. Therefore this estimate tends to be on the low or conservative side. However, some land may be converted within the 1945 built-up area. The two effects tend to counterbalance each other.

Still Room for All

Thus, we may conclude that 14.7 people per acre will fairly approximate the requirements of suitable and available land for urbanization during the last 15 years. To be conservative, let us estimate the rate at which new land will be used in the future to be one acre for every net increase of 12 persons, rather than 14.7.

If all the land suitable and available for urbanization were used at 12 per acre, a total of 5,746,800 new residents could be accommodated.

But this is more than the maximum number of residents expected by 1990. It is also more than the minimum number expected by 2010. Therefore, it is justifiable to state that the present stock of land which is available and reasonably suitable for urbanization should be sufficient for 30 to 50 years.

No one will dispute the statement that a 30- to 50-year supply of land for immediate use is a relative abundance. However, there must be assurance of eventual replenishment to this stock. Though it may raise other problems, this replenishment in supply is the key to the land shortage problem.

Freeways

Mere increases in land available for urbanization are of no use. It is an idle exercise to draw wider and wider rings around an urban center, each time including more area. The new land has to be good for urban purposes. This means it must be physically suitable and it must be reasonably close to employment centers. Employment centers provide goods and services as well as jobs.

These requirements can be met in two ways. Either the good land is "piped" to the job centers by means of a better transportation system or the job centers are put into the midst of the good land. As an urban area grows, ordinarily both things happen. Freeways are built which as a system connect to sufficient jobs to make new areas interesting for suburban development. Jobs move out to new subur-

ban locations. As a result the boundary of settlement should gradually move out just like the expansion in the diameter of a tree trunk.

This did not happen in the San Francisco Bay Area in the postwar period. Certainly new freeways were built, and new jobs moved to outlying centers, but the outposts of settlement did not change from 1950 to the present time.

The first wave of urbanization ending in 1950 was scattered over a wide area. In effect, urbanites staked out the limits of a large land supply based on existing urban nodes and did not venture beyond it during the 1950–60 period of heavy urbanization. Therefore, in an important sense, the amount of land believed to be in the supply was being used up.

This using up of a fixed supply of land has probably been a psychological factor partly responsible for the rising prices of new land in this metropolitan area. It is true that the land within the limits of urban development is being continuously upgraded in quality. Most sites become accessible to more and more employment and other opportunities as new jobs and services are created within the limited area.

Also, though to a smaller extent, the improvement effect of freeways may overcome increasing congestion, also making for better quality. Therefore, some of the price increases in land are justified. Further, as jobs and development move to the periphery, more and more land outside the margin of settlement ripens for possible urban uses.

Yet it is common knowledge among buyers and sellers that a limited amount of land is currently considered suitable for urbanization and that it is being used up at a substantial rate. This situation may well be inflationary, though it "should not be" in view of the half-million acre land supply.

The "fault" may lie in excessive scatter of the first wave rather than a lack of initiative in successive periods. A smaller area of settlement at first may have permitted step-by-step increases in the land supply, removing the psychological bugaboo of the fixed stock. However, we do not know if the large degree of scatter generated other important economies.

How to "Make" Land

The study of the San Francisco Bay Area supports the conclusion that large supplies of vacant land suitable for urban uses in relation to demands should be currently available throughout the nation. Certainly this is the confusion for the San Francisco area itself.

We have shown that this metropolitan area represents a national extreme (though not *the* national extreme) in pressures of population growth on available land supplies.

Therefore, if a 30- to 50-year supply of land is available in the San Francisco Bay Area, at least this supply should be available for the great bulk of other metropolitan areas in the nation. The study of the San Francisco area also supports the notion that elements of a speculative complex may be partly responsible for symptoms of land shortage.

This is not a purely psychological problem. Its solution rests on a realization that an integrated metropolitan authority can assure suitable future land supplies.

Public improvements in freeways, highways, county roads, rapid transit, bridges, tunnels, sewers, water, drainage, and regional parks are powerful

influences on land use if integrated under one general command.

The value of any location depends in large measure on how accessible it is to a gamut of metropolitan opportunities. This accessibility is levered by decisions of metropolitan authorities in the timing, location, and integration of public works.

Every metropolitan area is one huge land market. The various parts of this market compete with each other to provide accessibility to a common fund of metropolitan opportunities. By their decisions the metropolitan authorities can significantly control the conditions of competition among the various parts.

For example, any new freeway encourages one group of sites at the expense of others. Unfortunately, this public power is still a sleeping giant. The public tends to act when it is prodded by local and piecemeal pressures for service. Too, in many areas the unification of metropolitan authorities is completely lacking.

Integration of general command can help immensely in the creation of urban land if it is needed. Wisely conceived, the general command's decisions can also prevent the problem of inefficient utilization of too large an area. New employment centers can be encouraged or discouraged by these means in places surrounded by large areas of good land. Alternatively, good land may or may not be "piped" to old centers. The land created need not be inferior to land in the old supply. But this is a long story in itself.

If the proper steps are taken the margin of settlement can shift as necessary to bring in additional usable urban land. Such shifts in the land supply are essential to relieving actual land shortages, and may or may not be required to deal with the speculative complex.

In coping with both actual shortages and the speculative complex, readers should be guided in their thinking and decisions on land and metropolitan affairs by four propositions.

1. There are good reasons to believe that metropolitan areas in the United States tend to have large current stocks of land suitable for urbanization. These should accommodate any urban growth likely to develop over a reasonable length of time.
2. The most important element in the land shortage picture is not the fixed stock of land, but rather how rapidly the stock is replenished as well as how serviceable the new land is for urban uses.
3. Left to its own devices the market tends to increase the supply of land. However, these increases come in spurts; meanwhile temporary pressures on the land build up.
4. A key strategy in the fight against temporary pressures tends to be neglected: timing and locating freeways, sewer systems, water and drainage systems under one generalship throughout the metropolitan land market so as to gain desired land use objectives.

REFERENCES

1. Origins, mechanisms, and functions of tacit group behavior by land sellers are analyzed in Jack Lessinger's "Influences of Group Interests on Economic Decisions," *The American Journal of Economics and Sociology*, 19:3 (April, 1960), pp. 253–58. (Also reprinted by the Real Estate Research Program, Institute of Business and Economic Research, University of California, Berkeley.)

2. *Future Development of the San Francisco Bay Area*, 1960–2020, prepared and published by the U. S. Department of Commerce, Business and Defense Services Administration, Office of Area Development for the U. S. Army Engineer District, San Francisco Corps of Engineers. (Washington: December 1959), p. 55, Table 22.

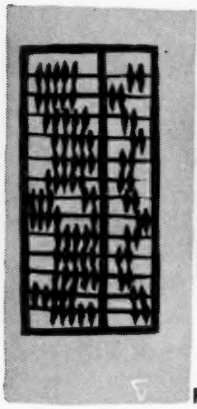
3. U. S. Department of Commerce, see note 2, Table B-1. The specific assumptions underlying these estimates are given in Appendix B.

4. We assume that the increase July 1, 1944 to July 1, 1959 is the same as January 1, 1945 to January 1, 1960. Population July 1944 was obtained from county auditor reports from San Francisco, Marin, Sonoma, Napa, Solano, Contra Costa, Alameda, Santa Clara and San Mateo counties. Population as of July 1, 1959, was interpolated from 1960 Bureau of the Census reports as of April 11, 1960, and California Department of Finance estimates for July 1, 1956.

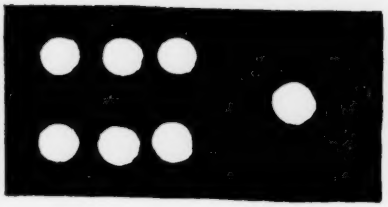
5. The author wishes to thank the Gas Division of the Pacific Gas and Electric Company for providing the records from which the land use sample was drawn.

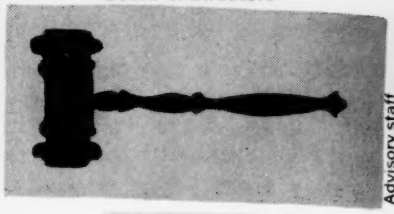
6. According to J. P. Sinclair, "Freeways in District IV," in *California Highways* (March–April, 1960), p. 13, there were 300 miles of freeway built in the San Francisco Metropolitan Area during the period 1950–60. Only small mileages were built before 1950. Mr. John Daniels, District IV, California Division of Highways has informed the author in a recent telephone conversation that a very rough estimate as to the taking of land by freeways would be one acre for every 200 feet. He also believed that existing county and state roads taken into the freeway right of way may roughly balance off the additional space required for interchanges. Thus freeways took, in all, about 7,920 acres. But we estimate that only 75 percent of all the freeway mileage cuts across land suitable and available for urbanization.

Board of Directors



Finance





Advisory staff

Management committee

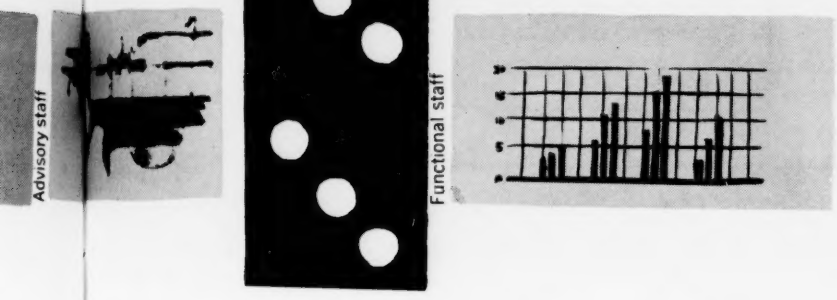
Manufacturing

Line

W. R. DILL
WILLIAM HOFFMAN
H. J. LEAVITT
THOMAS O'MARA

All four of the authors of this article are associated with the Graduate School of Industrial Administration at Carnegie Institute of Technology. Two, Drs. Dill and Leavitt, are faculty members, while Thomas P. O'Mara and William R. Hoffman, who received M.S.I.A. degrees in 1960, were graduate students who played the game as part of their studies. Mr. O'Mara now works for U. S. Steel and Mr. Hoffman is employed by IBM. Dr. Dill, Assistant Dean and Associate Professor of Industrial Administration at CIT, is one of the developers of the management game as it is played there. Dr. Leavitt is Professor of Industrial Administration and Psychology at CIT.

EXPERIENCES WITH A COMPLEX MANAGEMENT GAME



Games designed for teaching can also be used as diagnostic devices to spot weaknesses in the organization chart and as potent research tools into the dynamics of group behavior.

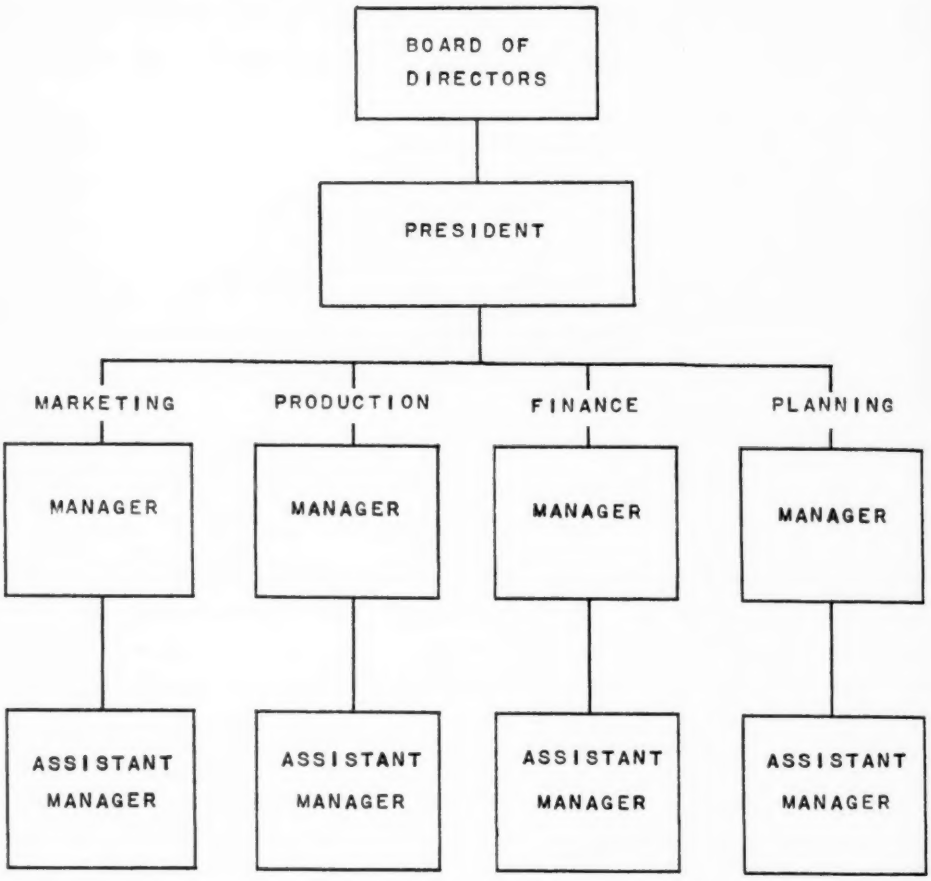
The complex CIT Management Game was played over most of the 1959–60 academic year by six teams of graduate students at our Graduate School of Industrial Administration. During that year we were able to collect data that bear both upon problems of education for management and on questions of social research. This paper reports our findings, first, on educational aspects of the game and second, on the implications of our data for some current issues in organizational research.

The CIT game differs from most business games because teams must deal with a larger number of variables, and because teams usually play it intermittently at the rate of one decision a week over a long period. At each decision period, each team must file about one hundred decisions. These govern the operations of their firms for a one-month "period" of play. Many of the decisions are general management decisions, but some apply specifically to production, marketing, and financial operations.

In the administration of the game reported here, players were graduate students, required to play, but given no course credit or other extraneous reward for playing or winning. Two industries, A and B, each consisting of three teams played the game, starting from identical positions. Teams A0 and B0 were given complete freedom

to develop their own structures. Teams A1 and B1 were given organization charts (Figure 1) and asked to appoint their members to the positions on the chart. Teams A2 and B2 were given the same charts with individuals already appointed (by the faculty) to all the jobs thereon.

FIGURE 1



ORGANIZATIONAL PATTERN IMPOSED ON TEAMS A1, A2, B1, AND B2.

Each team was assigned a "board of directors," made up of several faculty members. Teams reported to their boards periodically. Different boards defined their roles quite differently, so that some were more demanding of elaborate rationales for team decisions than others, and some took a firmer hand in determining team policy than others.

Data and Methods

Before the game, we were able to collect data on:

1. The "attractiveness" of the game to prospective players. These data took the form of rank assigned to the Management Game as voluntary activity among these alternatives: Carnegie Management

Game, Written Cases, Oral Cross Course Cases, Field Observation in Industry, Seminar in Writing and Speaking, Study of Ethics and Values in Business, Free time for Reading and Research, Involvement in Organizing Faculty Research.

2. The average intellectual capacities of the team as measured by scores on the ATGSB (Admission Test for Graduate Study in Business).[1]
3. The "Personality Types" of individual players, as measured by scores on the Myers-Briggs questionnaire.[2]
4. Players' predictions about which members of their teams would be most influential.

During the game, we were able to gather data on:

1. The over-all performance of each firm in the game, measured by gross profit figures.
2. Certain aspects of morale and attitudes, measured by questionnaire following each quarter of play (e.g., after every third decision). Our morale measure was the sum of the answers to the following nine questions, each scaled from 1 to 9:

   Evaluate the following: (1 = worst possible; 9 = best possible)

   1. Your team's current organizational setup.
   2. Your team's current leadership.
   3. The quality of team work in your team.
   4. The over-all quality of your team.
   5. The personal relationship now existing among team members.

   Evaluate the current direction of change in the following: (1 = deteriorating very fast; 9 = improving very fast)

   6. The morale of your team.
   7. The personal relationships among your team members.
   8. The quality of your team's analysis of problems in the game.
   9. Your team's status in the eyes of other teams.

After the game we were able to gather data, by interview, on:

1. The influence of individual players on one another.
2. The degree of dispersion of influence within teams.
3. The degrees of "consonance" (agreement among players about who was influential) in each team.

These three measures require additional explanation. The influence of individual members on one another was measured from responses, after the game, to the question "Who (on your team) influences ——?" Into the blank went the names of all members of one's team, one's self included.

The answers to this question were tabulated in matrix form to display first-order influence relationships (e.g., X influenced Y). Each team matrix was then squared, using techniques reported by Festinger (see bibliography) to discover second-order relationships as well (e.g., to show that if X influenced Y, and Y influenced Z, then X indirectly influenced Z, too).

Influence Index

An influence index was computed for each team member by adding together (1) the total number of men whom he was reported to have influenced directly and (2) the total number of men whom he was reported to

have influenced indirectly through a second person. The first-order and second-order influence totals were weighted equally.[3]

The standard deviation of the distribution of these indices for each team is the influence dispersion index. The greater the standard deviation, the greater were the differences in power among team members.

Our measure of consonance was derived from the difference between a team member's (X's) own perception of who influenced him, and the perceptions of all other team members about who influenced X. Consider, for example, the A01 row in the matrix for Firm A0 shown in Table 1. The circles under A02 and A06 mean that A01 says he was influenced by

TABLE 1

EXAMPLE OF DERIVATION OF FIRM CONSONANCE INDEX

DATA FROM FIRM A0
BASED ON QUESTION: "WHO (ON YOUR TEAM) INFLUENCES__?"
(CIRCLES, WHEN READ ACROSS ROWS, INDICATE RESPONSES TO:
"WHO INFLUENCES YOU?")

	A0 1	A0 2	A0 3	A0 4	A0 5	A0 6	TOTAL	INDIVIDUAL INDICES
A0 1	x	(2)	1	0	2	(4)	9	6/(9+4) = .462
A0 2	(4)	x	1	(1)	1	(3)	10	8/(10+7) = .470
A0 3	3	1	x	(5)	(3)	4	16	8/(16+2) = .445
A0 4	(3)	(1)	(2)	x	(2)	(5)	13	13/(13+12) = .518
A0 5	3	1	2	5	x	(2)	13	2/(13+3) = .125
A0 6	1	1	1	1	1	x	5	0/(5+0) = .000
						TOTAL FOR FIRM	=	37/94 = .394

those players only. The numbers in the circles, 2 and 4, mean that two (of possibly five) other team members agree that A01 is indeed influenced by A02, and four others agree that he is influenced by A06.

Our index for each member is the ratio of agreeing votes to the total of (1) votes cast by other members, *plus* (2) the votes that could have been cast, but were not, in the circled areas. Thus for A01 our consonance index equals $6/(9+3+1)$. The 9 in the denominator is the row total; the 3 is for votes that could have been cast for A02 but were not; and the 1 is for a vote that could have been cast for A06, but was not. The firm index in this case is 37/94 or .394.

This firm's consonance index, then, measures the extent to which members perceived the influence structure in the same way at the end of the game.

The over-all relationships among all of these pieces of data are summarized in Tables 2 and 3. Table 2 summarizes the data by firm; Table 3, by individual member.

TABLE II

SUMMARY OF SEVERAL MEASURES BY FIRM
(Means of Firms)

Firm	ATGSB Score	Attractiveness (Pre-Game)	Influence Dispersion Index (Range)	Consonance Index	Morale After			Profits After Taxes								
					Q_2	Q_3	Q_4	Q_1	Rank	Q_2	Rank	Q_3	Rank	Q_4	Rank	Total
A 0.....	591.0	2.9	3.2	.394	45.2	37.2	40.6	801	1	9,121	3	11,835	1	1,292	3	23,049
A 1.....	520.4	2.8	4.2	.586	36.4	39.4	55.5	17	3	9,158	2	11,197	2	4,200	1	24,572
A 2.....	552.5	2.3	2.3	.209	46.2	44.2	32.9	57	2	12,986	1	9,684	3	1,359	2	24,086
B 0.....	567.5	3.1	N.D.*	N.D.*	49.7	42.7	44.3	260	1	9,470	3	12,350	2	5,340	2	27,420
B 1.....	548.7	2.9	5.1	.510	38.5	42.4	51.0	(60)	2	11,695	2	19,074	1	8,290	1	38,999
B 2.....	538.5	2.1	1.1	.333	28.7	40.4	43.6	(538)	3	11,790	1	11,870	3	3,800	3	26,922

* Team BO was so decentralized, its members professed that questions about influence could not be sensibly answered.

TABLE III

SUMMARY OF SEVERAL MEASURES BY INDIVIDUAL PLAYERS
(Ranks of Individuals Within Firms)

Firm	Player	Predicted Influence	Consonance Index	Personality Type*	ATGSB	Actual Influence
A 0	A	1	6	13	4	1
	B	4.5	3	1	1	2.5
	C	4.5	2	1	3	4
	D	3	1	1 or 22	5	5
	E	2	5	5	2	2.5
	F	6	4	13	6	6
A 1	A	2	2	7–15	3	1.5
	B	4.5	3	14	1	1.5
	C	3	1	7	2	3
	D	1	4	1	5	4
	E	6	6	X	X	5.5
	F	4.5	5	3	4	5.5
A 2	A	2	2	1	3	2
	B	1	1	1	5	1
	C	5	3	1	6	3
	D	5	6	1–5	4	4
	E	3	5	6	2	5.5
	F	5	4	7	1	5.5
B 0	- - - - - -	- - - - - -	- - - - - -	- - - - - -	- - - - - -	No Data
B 1	A	3	4.5	5	5	1
	B	4	3	10	1	2
	C	1	4.5	15	3	3
	D	6.5	6	5	4	4
	E	2	1.5	5	2	5
	F	5	1.5	15	7	6
	G	6.5	7	5	6	7
B 2	A	1	1	1	6	3
	B	2.5	5	13	4	1.5
	C	2.5	2	7	5	1.5
	D	5	3	10	1	6
	E	6	4	1	2	4.5
	F	4	6	5	3	4.5

* Not a rank score; see text for explanation.

Educational Effects of Game

During these first plays of the Carnegie game, we looked for answers to several questions that we and others have raised about the role of our game—and games in general—as a setting for teaching managerial skills. These were the questions:

1. Will a complex game encourage teams to adopt the hierarchical patterns of organization which are so familiar in industry? Working with simpler games, we had had difficulty getting students—or even executives—to differentiate clear leader-follower roles in their groups.
2. Who plays the game well? Can the most influential team members be identified, *a priori*, by their intelligence or by other traits of personality? For the team that makes the most profit, is sheer analytic skill more characteristic than other managerial qualities?
3. Does the high morale and high involvement reported by the early users of management games carry over in the extended play of a more complex game? Student teams in this study made moves at roughly weekly intervals over a six month period, as an addition to an already heavy course load. Deadlines for decisions were imposed; but scheduled times to meet and make decisions were not provided.

Patterns of Organization

In designing the Carnegie game, we put a high value on giving players realistic experience in the functioning of hierarchical organizations. Normally, among graduate students or among executives-on-campus, there are strong egalitarian norms. Men are reluctant to assume either superior or subordinate roles on a continuing basis, especially in situations where their acceptance of these roles becomes a matter of record among faculty and peers.

Our efforts to encourage hierarchical organization with the Carnegie game included a variety of steps:

1. The very sizes and complexity of the game was intended to make it difficult for a team to operate as a "committee of the whole," with each member equally expert about each of the major fields of activity.
2. Large teams—initially with eight or nine members—were set up in hopes that the frustrations of arranging and conducting meetings would build pressures to differentiate roles and to break the organization into functional subgroups.
3. Each team was supervised by a faculty board of directors. In dealing with the teams, the directors tended to channel communications through the president (or through a few top officers). The president was expected to present most reports and recommendations, and he was held responsible for the whole team's operations.
4. Hierarchical organizations were imposed by the boards of directors on four of the six teams at the start of the game. Two teams (A0 and B0) were given complete freedom to organize as they pleased. Two teams (A1 and B1) were asked to appoint men to fill the jobs in the organization chart shown in Figure 1. The final two teams (A2 and B2) were set up in accordance with the chart in

Figure 1, and the board announced whom it wanted to fill each of the positions.

What happened? We were successful in getting a substantial degree of hierarchical organization in two teams, A1 and B1 (See Table 2). The influence dispersion index (Table 2) at the end of the game was 4.2 for A1 and 5.1 for B1. There was a moderate amount of influence spread in A0 and very little in A2 and B2.

By the time students had played the game for twelve decision periods, the complexity of the task had decreased considerably. Many decisions had become more or less routine. Profits, even for the weakest team, were quite high; consequently there was not much pressure for strong leadership or radical change. The teams had shrunk in size to six or seven members because some men were excused at the beginning of the spring semester. To a large extent, interest in rotating job assignments among team members had operated against the long-term stability of organizational hierarchies.

The way in which the boards of directors approached their jobs may help to explain why A1 and B1 did develop hierarchies. At the start of the game the directors of both A1 and B1 clearly saw their role as an active one—to call student attention to various problems, to goad them on performance, to evaluate and criticize what they had done, and to offer positive suggestions and advice on what the group might do. The directors of B0 and B2 also saw their role as an active one—but not as completely so as the directors of A1 and B1. The directors of A0 and A2, in contrast, defined for themselves a much more passive role—primarily to answer questions, to listen, and to observe.

The initial conditions of organization may also have had some effect. A1 and B1, the only two teams which showed the most differentiation in the influence of team members, were the two which had been required to use a particular organization pattern; but were also free to decide for themselves who would take each job.[4]

In summary, it was more difficult than we had expected to simulate the experience of life in a hierarchical organization for the teams. The game program has since been adjusted to sustain the level of complexity of the team's job through a long period of play, and further changes are being incorporated into a new game which is currently under development.

Much of the success in promoting hierarchical organization seems to depend on the arrangements under which the game is played and the attitudes which the boards of directors take. In the future, teams may also respond to the information that last year two hierarchically organized teams were the most profitable and had the highest end-of-game morale.

The Compleat Gamester

The Carnegie game is intended as a general management game which will be appropriate for educating men who aspire eventually to managerial, rather than specialist staff positions. The difference between it and simpler general management games is one of depth of simulation rather than one of basic purpose. Nonetheless, it may be that the added complexity of our game and the possibilities for attacking some problems in it by relatively sophisticated analytical techniques makes it more amenable to mastery by the intelligent analyst than by the good manager.

The issue involved is an important one. If high intelligence and related analytic skills are sufficient for success in the game, the game is probably not a good simulation of real managerial situations.

Using data about players which we already had in hand, we have explored the relationship of intelligence and four personality traits to success in the game—success as measured by the individual influence of team members and by the team's relative profit records.

As a measure of intelligence, we used the Admission Test for Graduate Study in Business (ATGSB), a general test of quantitative and verbal aptitude developed and administered by the Educational Testing Service and very similar in form to the aptitude sections of the Graduate Record Examination or the College Board examinations. Despite its name, the ATGSB is not a test of knowledge of business and related areas.[5]

Within the teams, there is no relationship between total scores on the ATGSB or between the verbal or quantitative subscores and the amount of influence which members had at the end of the game. Neither is there any relation between ATGSB score averages for a team and the amount of profits it earned over the course of the game.

Since there is a significant correlation in most business schools between ATGSB scores and course grades—(usually between .4 and .6, but occasionally as high as .7)—the game appears to do better than courses in calling forth non-intellective skills.

We do not yet know what the non-intellective correlates of personal influence or team profitability are. We tried to relate scores on one personality instrument, the Myers-Briggs questionnaire, to influence and profitability data; but the findings were all negative. The Myers-Briggs test is based on Jungian theories. For anyone who takes it, it yields one of 16 profiles, based on two-way classifications on each of four dimensions. The dominant side of his personality may be:

1. Extraversion (E) or Intraversion (I): a primary orientation to the world outside himself or to the world within.

2. Judging (J) or Perceiving (P): a primary tendency to make judgments and evaluations of what he experiences or simply to perceive and store his experience.

3. Thinking (T) or Feeling (F): in his judgments, a tendency to use a rational, analytic approach or to use an emotional approach.

4. Sensory (S) or Intuitive (N): in his perceptions, a tendency to rely literally on direct sensations or to make use of hunches and intuition.

We looked both at the distribution of over-all profiles on the test and at the distribution of scores on each of the four dimensions. From neither approach could we detect any relationship to individuals' influence on their team, to individuals' ability to agree with their teammates on what the influence structure looked like, or to teams' profit performance in the games.

Further work needs to be done with instruments that measure attitudes, values, and skills that are more closely related to the tasks that a management game player or a real-life manager faces. For the moment, though, we are

encouraged that the problems of predicting business game performance (like the problem of predicting managerial success) seem to be quite independent of the problems of predicting success in normal academic pursuits.

Playing the game over an extended period of time, as an overload, might not be viewed as especially conducive to good team morale. We did not hope to generate the high level of excitement and involvement that can be generated when games are played full time for a period of one to several days, without direct faculty supervision, and with strong competitive spirit among teams.

Morale Improved with Teamwork

Given the list of activities described above, players indicated (before the game started) a higher average preference for participating in the game than for any of the other alternatives. Morale was never exceptionally high for most of the players; but for the players who were preparing for careers in management (men in the School's M.S. program), morale increased steadily throughout the game.

The determinants of morale need more study, but a few things are clear. Students responded not only to their own profit performance, but to their successes and tribulations as an organization and to the arrangements under which the game was played.

Many people associated with the development of management games feel (without evidence as yet) that games can serve as a rich medium for organizational research. The second purpose of this paper is to present some findings about the organization and social structure of these game teams, and to try to relate those findings to some current issues in organizational and small group research.

Game Is Tool for Research

As the reader will see, our findings are not at all conclusive; but they are suggestive enough to make us believe that the game can indeed be usefully exploited as a research tool.

Although our data are not definitive, they have direct relevance for some current questions about organizational behavior. Here are several questions and the relationship of our data to them:

Let us consider first the general issue of "egalitarianism" vs. *hierarchical differentiation* in organizations.

One can argue that an egalitarian social structure makes for free and clear intercommunication, and hence for high morale and for effective group problem solving. But one can argue, conversely, that a group needs a differentiated power structure to perform effectively. It needs to have some members holding greater power than others, so that someone will take responsibility and make decisions.

Table 2 shows the influence dispersion index for the five teams on which we were able to gather end-of-game influence data. The data indicate that the two highest morale, highest profit firms, A1 and B1, show the greatest dispersion of influence; suggesting that egalitarian distribution of influence is neither necessary for successful problem solving, nor for high morale in these game firms.[8]

Our data also bear upon the issue of *perceptual consonance*. The point has often been made that mutual understanding of differences in people's power may be more important for a group's morale and readiness to work than equality of power. Our influence

index tells us which members are seen to be most influential; but it does not provide information about the extent of agreement among members about who was influential. The team consonance index in Table 2 is intended to do that job.

A1 and B1, the teams with the greatest morale and profitability, had the highest degrees of consonance. Our data are consistent with the hypothesis that groups whose members agree about the state of their internal relationships are more likely to be "successful." But high consonance in this case is also associated with high influence dispersion; which suggests either that people can agree about who influences whom when there are big (and hence more visible) differences in influence; or, alternatively, that members of "good groups" see things the same way, even if what they see is a hierarchy of influence.

If we turn now to data about individual firm members in Table 3, we make contact with some other current research issues.

Consider, for example, the general question of the *predictability of influence*. In this study, members made predictions about who would be influential in their firm. Months later they were asked to indicate who had actually been influential. The relationship (Table 3) is positive. To show it more lucidly, examine Table 4, which shows the average actual rank in influence (over 5 teams) of members of each predicted rank. The orderings match almost perfectly.

It is clear that team members were able to predict influence with considerable accuracy, a finding consistent with some other ongoing research about the reliability of observations of influence in groups.

TABLE IV

PREDICTED AND ACTUAL INFLUENCE

(5 Firms Averaged)

Predicted Influence (Rank)	Actual Average Influence (Rank)
1	2.4
2 (including 2.5)	2.3
3	3.6
4 (including 4.5)	4.2
5	4.9
6 (including 6.5)	5.4

What Are Influential People Like?

Finally, our data provide some material on another part of the question: "What are influential people like?"—on the relationship between actual influence and individual consonance indices. The individual consonance index (Table 3) can be thought of as a measure of the extent to which an individual's statement about who influences him is corroborated by his fellows. It turns out (Table 5) that in general more influential people may perceive their own influence more accurately than their less influential teammates do, though the degree of relationship is not very high at all.

TABLE V

RELATIONSHIP BETWEEN INDIVIDUAL CONSONANCE INDEX AND ACTUAL INFLUENCE

(5 Firms Averaged)

Consonance Index (Rank)	Average Actual Influence (Rank)
1 (including 1.5)	3.2
2	2.3
3	3.0
4 (including 4.5)	4.0
5	3.8
6	3.8
7	7.0

Conclusions

Management games are usually used primarily as educational devices. They can also be used as research devices, either contemporaneously with their educational use or as an independent mechanism, which opens up possibilities for further experiments.

Our experience with one extended run of the CIT game demonstrates that it is quite possible (1) to evaluate certain educational aspects of the game; and (2) to gather data from the play of the game about some questions of organizational and group behavior.

In this instance we were able to investigate relationships between game performance and (1) individual ability, (no relationship); (2) personality variables, (no relationship); (3) dispersion of power (influence) within teams, (more dispersion, better performance); and (4) consonance of perceptions of influence within teams (more consonance, better performance). We were able also to show positive relationships between predictions about influence made before the game and actual influence measured just after the game; and between one's personal influence and the consonance of one's perceptions with the perceptions of his teammates.

REFERENCES

1. Validity data on the ATGSB are available from Educational Testing Service, Princeton, New Jersey.

2. Educational Testing Service, Princeton, New Jersey.

3. Hoffman and O'Mara originally computed an influence index suggested by Katz (4). This weights second-order and higher-order influence relationships according to the probability, *a*, that higher-order links will in fact be used. It is a more sophisticated measure than the one we finally decided on, but it was not feasible to estimate the *a* in Katz's equations empirically, or to choose a single value of *a* on *a priori* grounds that would yield solutions to Katz's equations for all the teams.

4. In using the Carnegie game with five-man teams from our *Program for Executives* we were most successful in establishing formal divisions of work among functional specialties than we were playing the IBM game with five-man teams. (The executives were free to organize themselves as they pleased, and they did not have to report to boards of directors.) It is not clear in the executive runs of the Carnegie game, though, that hierarchical relations were any stronger than they were in runs of the IBM game. The chief executive did have a more substantial agenda planning and coordinating job to do.

5. The intercorrelations between scores for the same men on the ATGSB and the aptitude section of the GRE are in the .7 to .9 range in studies that we have done at Carnegie.

6. Ghiselli and Lodahl (3) report a high correlation between *skewness* in the distribution of certain traits among group members and group effectiveness; a finding which seems supportive of the one reported here.

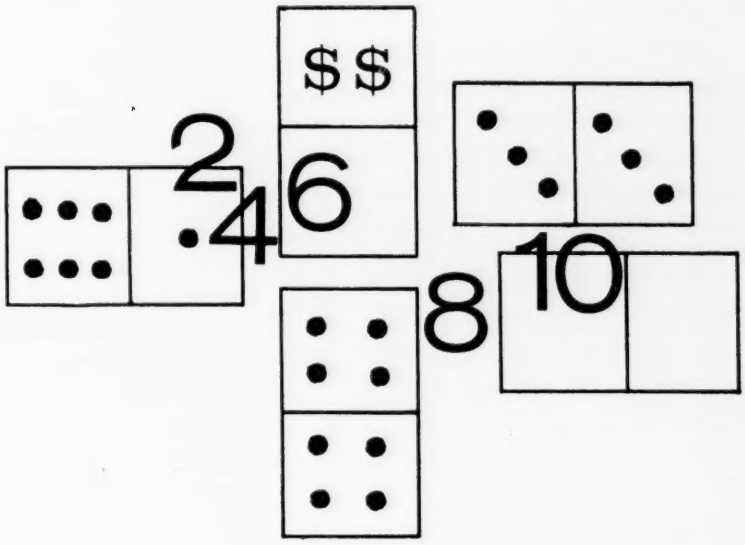
BIBLIOGRAPHY

Cohen, K. J. et al., "The Carnegie Tech Management Game," *Journal of Business*, October, 1960.

Festinger, L., Schachter, S. and Back, K., *Social Pressures in Informal Groups* (Harper, New York, 1950).

Ghiselli, E. E. and Lodahl, T. M., "Patterns of Management Traits and Group Effectiveness," *Journal of Abnormal and Social Psychology*, July, 1958, Vol. 57, No. 1.

Katz, L., "A New Status Index Derived from Sociometric Analysis," *Psychometrica*, March, 1953, Vol. 18, No. 1.



RHOCHREMATICS

This new approach, which cuts across the organization chart and realigns duties and functions in terms of the flow process, can bring about far-reaching changes in the handling of men, money, and materials. Firms which have tried it, among them Purex Corporation, find that it cuts costs and inventories and improves operations in many other ways.

Rhochrematics, which is the new science of material and information flow, has many implications for top management. Developed to foster a systematic, integrated approach to managing the flow of raw materials, parts, components, and finished goods, its chief concept is that of maintaining the flow of the product from raw materials to the ultimate consumer.

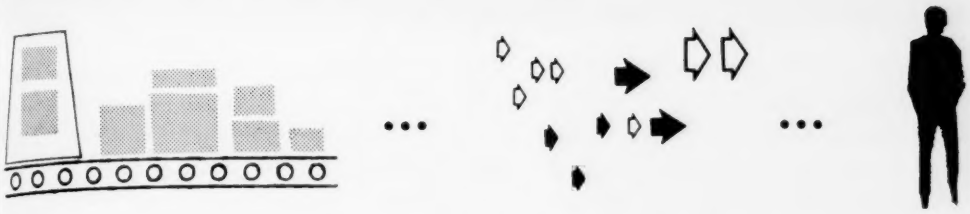
In maintaining this flow it cuts across the traditional organization chart, and undermines some time-honored management practices, but companies practising Rhochrematics have discovered that it also cuts costs and compresses lead time.

In the case of the Boeing Airplane Company, whose Transport Division adopted this new approach following a survey in June, 1960, savings to date

Stanley H. Brewer, Professor of Transportation at the College of Business Administration, University of Washington, has served as consultant to several major airlines, the Port of New York Authority, steamship lines, and manufacturers. He is the author of numerous articles and monographs and is frequently called to testify as an expert witness before Congressional Committees and regulatory agencies.

His co-author, James Rosenzweig, is Associate Professor of Policy and Administration at the same university. His specialties are business and operations research, data processing and administration. He has served as consultant in marketing research for Kaiser Aluminum and Washington Steel Products and, since 1957, has served as special consultant to the Boeing Airplane Company. His most recent assignment there was as Consultant to the Director of Operations Planning and Control, Transport Division.

• Substantial research on various aspects of integrated approaches to management of material flows has been done at the University of Washington. Sponsorship during the past year of projects which resulted in many of the conclusions reached herein should be credited to The Flying Tiger Line of Burbank, California, and to Canadair, a Subsidiary of General Dynamics, of Montreal, Quebec.



ORGANIZATIONAL ADJUSTMENTS

STANLEY H. BREWER JAMES ROSENZWEIG

in reduced inventories and lead times are conservatively estimated to exceed $300,000 per year.

Boeing's experience with Rhochrematics and that of the Purex Corporation, another recent convert to the new science, will be discussed in detail later in this article, as cases in point, but the essential thesis here is that managements wishing to profit from this new science must also be willing to accept its chief concept which is continuous concentration on the flow of the manufacturing process and may involve a complete restructuring of management's accepted channels of authority and ways of doing things.

The term Rhochrematics is a coined word and stands for the flow of things. It comes from two Greek roots, "rhoe" which means a flow as of a river or a stream and "chrema" which stands for products, materials, or things, including information. The abstract ending "ics" has been added here as for any of the sciences, such as mathematics, physics, etc.[1] From the time requirements are established and production planning is accomplished until an end product is delivered to the final consumer, many decisions are made which should be coordinated in order to optimize the entire material flow process.

Aspects of this process are being analyzed continually by almost every producer, wholesaler, or retailer. More and more attention is being devoted to physical distribution, materials management, inventory control, and other aspects of the material flow process. In most cases, however, analyses are carried out in each of these areas with little regard for the effects of changes on other areas. Hence, optimal solutions are often proposed for a segment of the flow process without due consideration for the resultant changes in the total flow pattern. Separate functions are optimized while the total operation proceeds in a suboptimal fashion.

This article attempts to ascertain the benefits that might accrue from a systematic, integrated approach to the over-all problem of material flow. Since material and information flows cut horizontally across typical vertical organizations, it will be vital to assess the impact on the organization structure of a change in approach. We will point out the benefits that might accrue, set forth some ideas on how organizations might be adjusted, and assess the likelihood of such changes in the future.

"Product Mission"

A total concept, the flow of material and information from the raw material stage through production and distribution to the ultimate consumer, is difficult to conceive and, as such, has

not been the target of concerted efforts toward optimization. The total flow is often so complex, involving many separate organizations and agencies, that no one agency has assumed total responsibility for the entire process.

However, when the entire "product mission" is visualized, it is easier to fit the separate parts together and make a systematic, integrated analysis of the entire system of material and information flow. While the time is not far off when such complex systems can be analyzed, via simulation or similar techniques, most attention has been devoted to one or the other of the two major sub-parts of the total flow process, production or distribution.

The flow of material from the raw material stage through the production process to the finished goods stage has been the subject of analysis for management scientists, efficiency experts, and industrial engineers for many years. A great deal of attention has been focused on isolated segments of this internal flow; e.g., costs of acquisition vs. costs of storage, inventory control, production control, expediting, and materials handling. However, little attention has been given to an integrated approach which focuses on the flow process itself rather than on individual functional areas.

Flow Concept

The flow of materials from the finished goods stage to the final consumer also has been the subject of many cost reduction efforts. There has been much furor over the fact that in many cases distribution costs actually exceed costs of production. Accordingly, much attention has been devoted to developing more efficient systems.

However, improvements in the distribution system are often made without reference to possible effects on the production function. More attention must be devoted to analysis of the over-all flow of material and information to optimize the entire process. Continued attention to individual departments, sub-areas, or functions will, of course, develop increased efficiency in isolated segments. However, such increased efficiency may be detrimental to the overall operation.

In this article we will discuss both of the major subdivisions of the material flow process, production and distribution. Attention will also be given to an integrated approach to the overall flow process, including both internal and external flows.

Organizing for Performance

In all cases, an attempt will be made to show how improvement in isolated functional department areas may not lead to over-all efficiency. Since this problem of optimizing material and information flow is inexorably tied to organization, it will be desirable to set the stage for later analysis by discussing some of the basic concepts of organization, and pointing out their effect upon the problem of material and information flow.

While it is obvious that contemporary organizations must be concerned with multiple goals, the business organization's primary task is that of translating raw materials into goods or services for producers or consumers through efficient utilization of capital and human resources. Business organizations have been growing continuously in size and complexity and undoubtedly will continue in this direction as long as the economy increases in complexity and society becomes more sophisticated.

In their chapter on "Molding of Organization in Modern Society," Pfiffner and Sherwood sum up the factors leading toward greater complexity as follows:

"The many factors that have operated to make modern organizations complex are just those which have served to complicate the entire fabric of society. They include: 1) the liberation of the individual in our social philosophy and policies; 2) the development of new understandings of the nature of human cooperation; 3) the broadening range of organization goals; and 4) the movement toward task specialization."[2]

Specializing Invites Fragmentation

This latter point is of particular importance for our purposes here. As organizations grow, the many functions that must be performed tend to be split off into various divisions, departments, groups, or units. As this fragmentation occurs, the need for specialists within the organization increases.

Each specialist tends to assume his role and to become more proficient in carrying out his particular duties. The larger the company and the greater the degree of specialization, the more the tendency to lose track of over-all objectives of the firm and to concentrate on strengthening the individual function.

The specialist is motivated by a desire to perform efficiently and move up in the organization; but, for the most part, he is limited by departmental boundary lines. Normally, he can assume more duties within his particular department, but he does not take over functions that are being performed by other departments or divisions unless there is a reorganization. Often, therefore, specialization becomes identified with functionalization. While separating duties and responsibilities on the basis of functions is only one of a number of possible alternatives, it turns out to be an overriding consideration in many cases.

Work might be divided on the basis of time sequences; for example, planning, execution, and control. However, formal organization structure does not ordinarily follow such a pattern. Equipment is not often the basis for departmentation. Processes such as milling, grinding, or heat treating often serve as a basis for organizing work groups. However, process and function are often hard to distinguish and processes might be considered as sub-functions to production.

If two or more classes of customers are entirely different, a company might well organize separate work groups to produce for different customers. Companies producing for both the military and consumer sectors of the economy might be well advised to separate completely their operations in order that entirely different requirements can be met efficiently. Geographic location of divisions or branches is a typical approach to dividing the work.

Dividing the Work

However, within each of the decentralized units there is also an organization structure which is likely to stem from some more basic factor. Multi-product companies may divide the work according to individual products or product groups in order to focus attention on the objectives of subunits of the organization. In such cases, conflicts may arise between product or product group managers and functional managers who have

traditionally been responsible for carrying out the basic functions of the enterprise.

Is Vertical Organization Best?

Traditionally, organization has been predominantly vertical and hierarchical with authority and responsibility resting in individual functions. Typically, superior-subordinate relationships have been established on a functional basis, with orders and instructions going down the line and reports and requests going up the line. Recently, this traditional approach has been questioned as the most suitable for over-all efficiency of the operation.

For example, the flow of material and information in the typical manufacturing operation tends to flow horizontally, cutting across the vertical structuring of functional authority. In discussing new technology and its impact upon organization, Jasinski states:

> "But technology, including both integrated data processing and integrated machine production, has developed on what might be called a horizontal plane. That is, the machine cuts across superior-subordinate relationships, affecting the jobs of people in different areas, departments, and work groups. Superimposing a strictly vertical organization structure on a technology which emphasizes horizontal and diagonal relationships can and does cause obvious difficulties . . . Certainly it is management's job not only to recognize these new relationships, but also to take steps to enable them to function definitely and smoothly. A few managers have recognized the discrepancy between organization and technology, and have taken steps to integrate the two. They have achieved such integration in a variety of ways, which essentially may be classified as: 1. Changing the technology to conform with the existing organizational structure. 2. Changing the organization so as to define and formalize the relationships required by the technology. 3. Maintaining both the existing organization and the existing technology, but introducing mechanisms to reduce or minimize the discrepancies between the two."[3]

Focusing attention on the *flow* of material and information as stressed in Rhochrematics, allows the rethinking called for by Jasinski. The problem, in short then, is that most companies organized in the traditional functional fashion are not set up to take advantage of conceptualizing the total flow process.

The remainder of this analysis will approach this problem by discussing: (1) how differences in orientation result in different emphasis in organization structure; (2) how traditional functional specialization may suboptimize the over-all operations; (3) alternative approaches to controls over material movement; (4) some case studies; (5) some generalizations; (6) developments facilitating a Rhochrematics approach; (7) possible approaches to implementing such thinking in existing organizations.

Differences in Orientation

Regardless of the formal organization structure, the strengths and weaknesses of a company may well depend upon its orientation. Some functions may be stressed with little attention devoted to others, according to the

importance of the particular functions to the company's success.

A study of organization charts for companies producing identical products shows that there are often differences in emphasis but that there is a tendency toward similarity, at least formally. A marked similarity can be seen in the way companies producing the same product are organized at the top management or department level, but differences are found within the sub-departments, groups and units.

Intra-departmental differences indicate that similar functions are performed in vastly different ways among companies producing the same or similar products. The performance of functions often revolves around personalities, interests, and abilities. The background and capability of the departmental manager influence performance, but many times the differences result from physical location with respect to markets, raw material, labor supply, or other factors of importance to the enterprise.

Products Shape Organization Chart

The organization charts of companies producing different products are more likely to be dissimilar than those of companies producing the same product. Yet the pressure of precedent and the similarity of basic functions to be performed tend to set patterns for the organization of all companies. Top management's interest in, or orientation to, any one or combinations of these functions is the greatest stimulus for setting patterns of organization.

The two most basic (or organic) functions of any organization are normally conceded to be production and distribution. As a consequence, they receive the greatest amount of attention, interest, and analysis. Accordingly, greater proficiency tends to develop in the performance of these functions. There also seems to be some interest in integrating the effort that goes into the performance of these basic functions. Other sub-functions tend to be performed (without much integration) by specialists whose role or mission is considered to be support of and service to marketing and production departments.

Should Production Lead Flow?

This is characteristically true of the various phases of the material flow process. Companies that distribute products to almost every community in the United States tend to be sales oriented. Normally, their products are marketed in a highly competitive atmosphere. Without large budgets for advertising and promotion, plus constant pressure to sell stemming from top management, a share of the many markets each company is trying to serve may be lost. Once a competitor captures a disproportionate share of the available customers in any one market, he tends to hold them. This does not mean that production can be slighted, because, of course, availability of good quality products is one of the keynotes to success for the salesman.

Sales are important to all companies, but engineering and production get more attention in companies producing capital equipment and some types of durable goods. Established companies producing airplanes, heavy equipment, and machinery, for example, know that if they develop a superior product their salesmen will be able to capture their considered share of the total market.

Physical distribution of products is

often a relatively simple task, maybe little more than delivering orders. The internal flow of material during the production process is of concern to such companies, however. Regardless of orientation, all companies are faced with some aspects of the total material flow process and can benefit from rethinking along the lines of Rhochrematics.

Suboptimization by Specialization

Although many companies tend to be oriented to the finance function, the legal function, the purchasing function, and others, sales and production remain as the basic subdivisions in most organizations. Within each of these organic functions, many subfunctions are set up as separate departments or units.

The resulting fractionalization makes visualizing the total flow process difficult. Each department, in an effort to protect itself against possible delays and to make a good showing for economy, tends to pad the time schedule in its favor with the result that the entire time schedule, or flow process, is slowed down and paper "economies" prove very costly.

In the average firm, material flows originate with the tool and production planning phase. Although planning may build considerable flexibility into the schedule of production runs, this fact is seldom apparent in the paperwork issued to purchasing.

Padding the Time Schedule

With the schedule in hand, purchasing sets up a program for acquisition of needed materials and builds in safeguards to protect itself against delays in delivery and all other possible contingencies. Next, traffic takes over and builds in a second time "hedge" against unscheduled contingencies regardless of what this may do to slow down the flow of the total operation.

Since both purchasing and traffic are service departments, they are extremely cost conscious. Holding down or reducing costs is a concern to top management, and cost reduction is a way for service units to bring attention to themselves; usually by trying to optimize the particular functions delegated to them. For purchasing this normally means buying at the lowest unit cost consistent with company policies and programs.

Also, the traffic manager is motivated to purchase transportation services at the lowest unit cost, normally meaning large quantity movements, either truck load or carload lots.

Optimization of these two functions normally results in the creation of inventories, establishing requirements for warehousing or storage. This, in turn, enforces requirements for inventory management or control.

Coordinating Material Flow

Within the plant or factory there may be several stops for material—receiving, receiving inspection, storage, processing, quality control, and the production line. From the production line the material—in a different form or as finished goods—is again moved to storage or the shipping dock.

The flow of the outbound material is also influenced by several functional departments or units. Prompt delivery service may be the primary consideration insofar as the sales manager is concerned.

Shipping is normally concerned with getting the order ready and loading it aboard the carrier, after which

time it becomes the responsibility of traffic. Other complexities enter the picture when regional company owned or public warehouses are used in the distribution process.

In extremely large companies many of these functions are performed in widely separated departments with a tendency toward optimization of individual functions and little consideration of the total material flow process. This is the concern of Rhochrematics. The further companies go in their growth patterns, the greater the tendency toward functional specialization within each of the units involved in the material flow process, making coordination, integration, and managerial controls extremely important.

The Question of Controls

Managerial controls are normally exercised over departments or functions, by establishing criteria, standards, or expectations. Deviations are analyzed with reference to predetermined tolerances. The greater the degree of specialization and orientation toward a particular function, the more precise the standards for controlling the activity. For small units within major departments, all deviations must be carefully explained.

Extraneous factors or influences are often the only acceptable explanation in the face of pressures from the department manager to increase the output of activities or services rendered by a small unit. And, the efficiency of the unit is judged by its ability to hold costs at the lowest possible level. Such pressures increase the tendency toward optimization of specialized functions. In the absence of good managerial controls, the specialist normally attains his position through loyalty and conscientiousness; traits which might lead to efficient performance of the specialized function.

Rethinking

The larger the company, the greater the degree of organization, resulting in the establishment of standards and procedures for the disposition of discipline. A high degree of discipline normally results in greater efficiency insofar as specialized functions are concerned. It also tends to destroy initiative and this in turn results in more and more suboptimization of the total flow process.

This is sometimes carried on to the extent that individuals within a particular group or unit end up virtually working for themselves and do not coordinate their activities with other employees in their own unit or group. They almost completely lose sight of the over-all objectives of the business organization.

The desirability of managerial controls for the total flow cannot be overemphasized, but the limitations on these controls, cannot be overstated. Controls can only be exercised when standards have been established and information is available to measure deviations from these standards. When functions are so fragmented that information is never brought together at a central source, standards cannot be established and managerial controls can, therefore, not be exercised. Rhochrematics fosters rethinking which may facilitate a fresh, integrated approach to controls.

Managerial Orientation

One approach to better control of material flows is flexible management orientation. Since top management is ordinarily concerned with major functions such as sales, production, and

finance, minor sub-functions such as traffic, inventory control, receiving, inspection, materials management, warehousing, shipping, order processing, and purchasing are left to specialists. Specialists tend to establish their own standards, and managerial controls are exercised around these self-imposed standards. There is very little germination of ideas for the integration of interrelated minor functions.

Major pressures that arise in the sales oriented organization seldom develop in terms of a minor function. Problems of the sub-departments often seem insignificant in light of the major objectives of the organization. While material flows are regarded as necessary and extremely important to the conduct of the sales function, the units responsible for this activity are normally regarded as service groups, and the quality of that service is often the only concern of the sales department.

There are constant pressures to give better service regardless of cost, and the most important consideration is probably lost sales or out of stock situations that result from inefficiency on the part of those responsible for material flow. In extreme cases, these service groups begin to incur costs greater than the profits made from individual sales. Since physical distribution is considered a "necessary evil," material flow costs become a disproportionately high percentage of the sales dollar.

Pressures that develop in a production oriented organization will often act as deterrents to good management practices for the control of material flows. Planning in such organizations revolves around the production schedule. An important aspect of the production schedule is the need to meet predetermined load dates; a requirement that is continually impressed upon the minds of the managers of service or support groups that have the job of getting the materials to the load point on the production line.

Distorted Production Schedules

The importance of meeting the production schedule cannot be taken lightly, but side effects should be given some consideration. In order to make absolutely sure that no load date is missed, the many groups that are responsible for managing isolated phases of material flows are likely to build successive high margins of safety which can become extremely costly to the company.

Estimaters are likely to be generous on the theory that some of the material may not meet specifications. Purchasers will often have vendors ship early on the theory that vendors may not be able to meet their own production schedules. Traffic is likely to have buyers plan for maximum transit time rather than median or minimum transit time. Receiving inspection will want more than ample time to perform their function.

Rework and quality control are motivated to plan for the maximum amount of time that might be required to accomplish their task. Inventory control and warehousing will normally add a protective cushion of time to allow for unknown contingencies. All these protective cushions of time add substantially to the capital costs of carrying pipeline inventories of the various materials destined for the production line.

In spite of all the effort to the contrary, shortages do occur. The larger and more complex the production

activity, the greater is the concern over shortages. This is understandable because a shortage of one small part can conceivably tie up the entire production line. Hence, much effort is devoted to the shortage problem, including the use of premium forms of transportation to expedite needed materials. While some companies consider such extraordinary measures for solving a shortage problem to be a cardinal sin, little thought is given to the fact that hundreds of thousands of dollars worth of material may have arrived weeks or months prior to the time that they were required.

The cost of carrying such inventories and the overages that result from service units protecting themselves against all possible contingencies may receive little attention in the production oriented company. There is often a substantial amount of frenzied activity and many thousands of dollars spent on the shortage problem, but inconspicuous overages may be more costly than shortages that are spotlighted for attention.

Often Takes Drastic Action

Each department manager who has responsibility over some element of the material flow process seems to feel that his special function is more important than that of other department heads. The independence with which people in one department are able to operate is a deterrent to implementation of the Rhochrematics concept. The need for coordination and cooperation between departments in the organization is usually stressed, but as long as pressures come vertically down the hierarchical chain and the security and protection of broad departmental boundary lines remains, there is little likelihood that something as complicated as the material flow process can be properly integrated.

Communications Breakdown

Even when there is an extreme desire to work together, there is often a breakdown in communication and flows of information. The many activities related to material flows tend to be extremely complex and require much documentation and record keeping. The many forms and memoranda that are developed in connection with a particular transaction involving the movement of any one of many thousands of items are seldom if ever brought together in one file in a large organization.

Each individual functionally specialized unit has its own records to provide primary information for the activity of the department. Secondary information that is of value to some other unit or combination of units normally is extracted only when something goes wrong. There is seldom any attempt to extract at each stage secondary information that is related to the material flow process.

It is obvious that fairly drastic steps must be taken by companies if controls are to be established around the flow process rather than around the traditional functional departments. These steps include management rethinking and reorientation plus some obvious organizational adjustments which may include authority and responsibility channels cutting horizontally across (flowing) the traditional vertical arrangements. The following section presents several cases where innovations have been made or are being considered to allow the organization to focus on its primary responsibility, the flow of material and information.

How Two Firms Did It

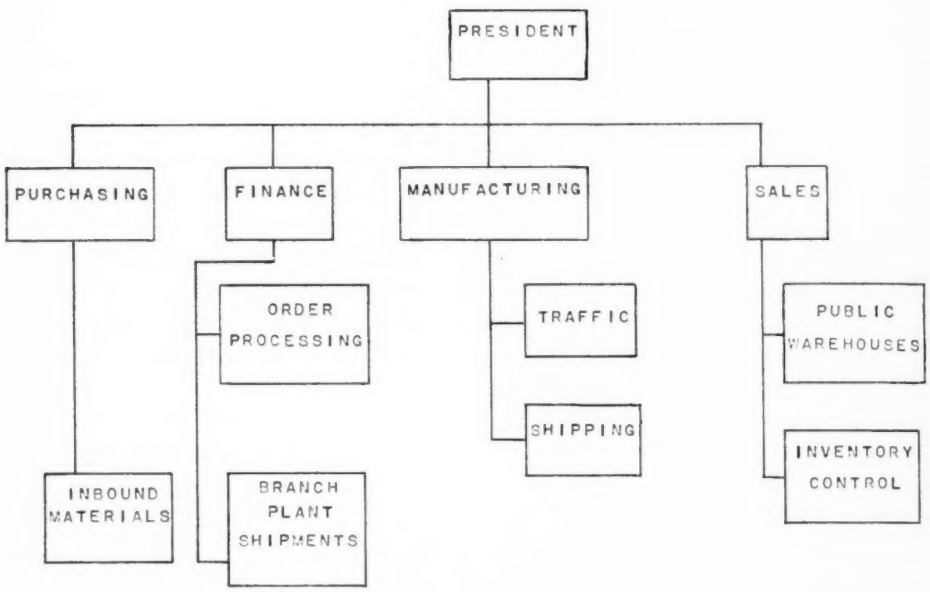
Two examples will be used to illustrate the kinds of innovation that can produce results. In one case, emphasis is placed on the external flow of material and information, primarily the physical distribution of finished goods. In the other case, emphasis is placed on the internal flow of material and information because the company involved is production oriented.

The Purex Story

The Purex Corporation has changed from an organization that could be considered traditional, with many of the materials flow functions fragmented and responsibility divided between several of the major departments, to an organization stressing integrated management of material flow functions. The old organization, as shown in Figure 1, had a traffic manager responsible for arranging transportation of outbound products from major production plants to warehouses and other distribution points.

FIGURE 1

ORGANIZATION OF PUREX CORPORATION
PRIOR TO ADOPTION OF DISTRIBUTION MANAGEMENT CONCEPT



The production planning function was not formalized at that time and was handled by informal committees with members from sales, manufacturing, and finance. The warehousing function was handled by the sales department for the most part, as was inventory control. Managers of a number of the smaller plants reported to finance.

These plants produced liquid bleach throughout the country and handled some warehousing of finished products produced at other major production facilities. Outbound movements from these plants were the re-

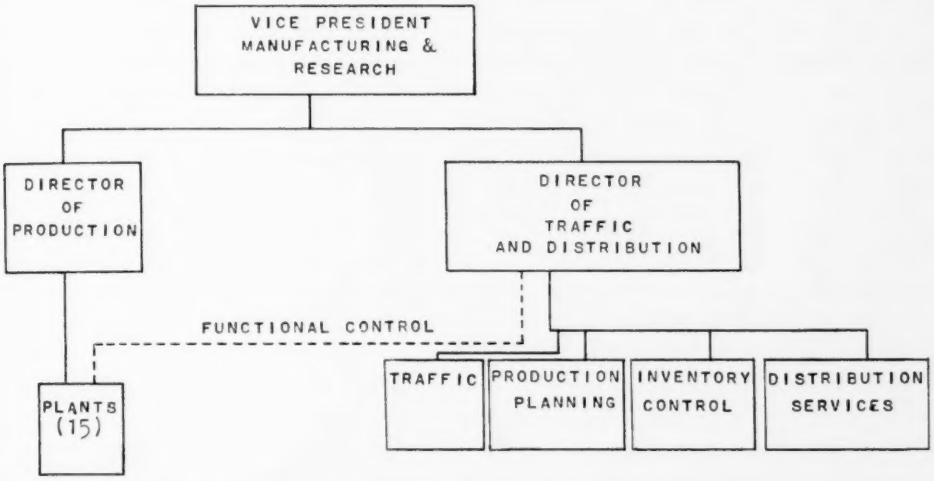
sponsibility of the plant manager and, as a result, the lines of authority for these functions emanated from the vice president of finance. Some functional authority was exercised by the traffic manager because it was his duty to furnish routing guides and common carrier rates. Inasmuch as the sales department was responsible for inventory control and maintenance of stocks at regional public warehouses, it also exercised control over outbound movements from these facilities.

Realignment of Duties

Purchasing in this organization was responsible for control of all inbound movements of raw materials and supplies. Order processing was a function of finance, and shipping reported to

FIGURE 2

ORGANIZATION OF PUREX CORPORATION
FOR CONTROL OF MATERIAL FLOWS
AFTER ADOPTION OF DISTRIBUTION MANAGEMENT CONCEPT



manufacturing. There was no attempt to exercise over-all control of the material flow process and, as a result, many inefficiencies developed leading to substantially higher costs than warranted.

Flow System Streamlines Planning

The current organization of the Purex Corporation's material flow function is shown in Figure 2. Production planning has been formalized and put directly under the jurisdiction of the director of traffic and distribution. In addition to the planning function, he has direct line authority over inventory control, distribution services, and traffic.

Regional traffic managers report directly to him and, in addition, he has functional control over the distribution function at the various branch plants. Since these branch plants now report directly to the director of production, who in turn reports to the vice president of manufacturing and research, this funtional authority almost achieves line status because the traffic director can exercise a great deal of control over all activities affecting materials movement at the branch plant level.

Direct line authority over inventory control now gives him the power he needs to control movement both into and out of public warehouses located throughout the country. Although the chart does not depict it, the director of traffic and distribution also works closely with the director of purchasing in controlling inbound shipments of raw materials and supplies.

Savings Effected

The new organizational arrangement has resulted in many benefits to the company. Although cost reductions are difficult to determine, especially when a corporation is growing as rapidly as is the Purex Corporation, most officials of the company agree that total savings are in the high six figures. Public warehouses have been cut by nearly one-half, from 65 to 35. More efficient management controls are now exercised over inventories and production planning.

Integrated management of many of the functions related to the material flow process is being exercised. Information on all these related functions is converted to punched cards, and the data are analyzed in various ways by means of an electronic computer to obtain day-to-day operating data that are used to plan efficient production, hold inventories at minimum levels, and reduce transportation costs. Continuing attention to and sophistication of the management of material flows is planned by the Purex Corporation.

The Boeing Experience

Investigation of possibilities for better integration of the management of material flows resulted in a case study of the Transport Division of the Boeing Airplane Company in the summer of 1960 conducted by University of Washington faculty members. The initial study resulted in plans to reduce inventories and cut lead times, moves that are conservatively estimated to save the company more than $300,000 per year.

Although reorganization of the functions related to material flows has not as yet resulted, company officials are most enthusiastic about the opportunities and are giving serious consideration to inaugurating a program of reorganization. Figure 3 shows the manner in which different activities concerned with material flows are now organized in the Transport Division of the Boeing Airplane Company. Serious thought is being given to a plan for realigning these functions into one department.

Here we see two differently oriented companies. The Purex Corporation, with its more than 200 finished products that must be distributed from many plants and warehouses to wholesalers and retailers through the United States, is primarily concerned with outbound movements of finished goods. The heavy moving inbound materials are few in number and consist primarily of bulk shipments of chemicals, oils, and tallow. Packaging materials are also heavy moving inbound items.

The primary concern of the Boeing Company, on the other hand, is inbound and internal movement of the more than 100,000 different parts, pieces, and raw materials that go into the production of each airplane. The parts, together with the machinery and supplies that are used in the factory, must be assembled from nearly every state in the country. For the most part, each individual shipment is very small. The end product is the airplane, which

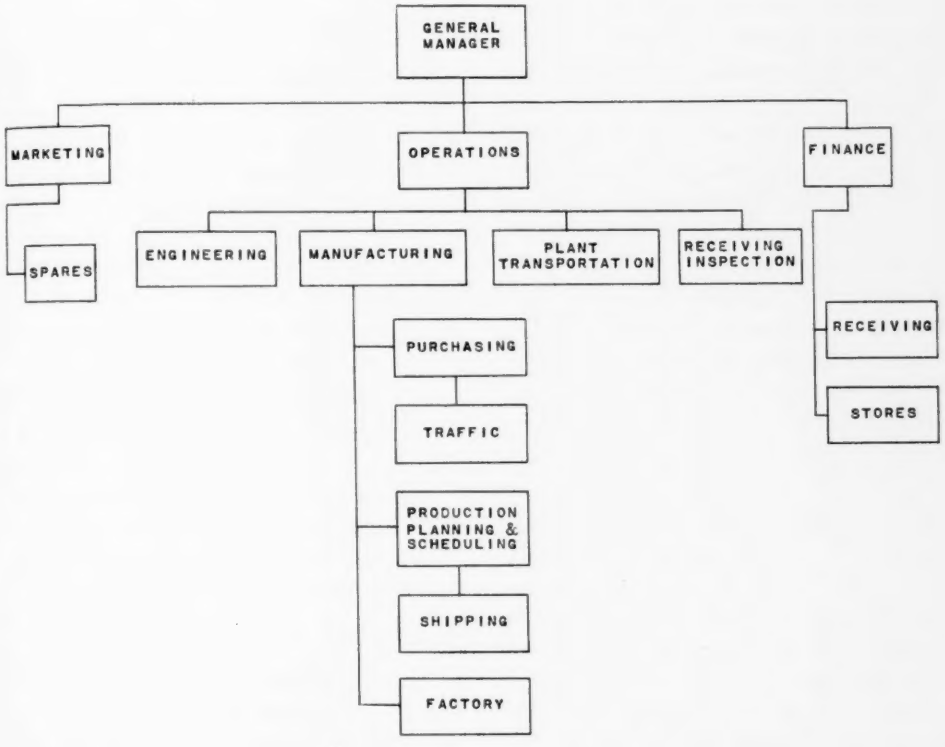
is flown away by the customer. Distribution activities are concerned primarily with spares that must be moved to a limited number of airline companies plus the military organizations that purchase airplanes. Boeing is very much production oriented but, of course, sales is an important activity.

System Works in Both Plants

Purex, on the other hand, might be considered sales oriented; yet, production plays a vital role. These companies are the antithesis of one another insofar as their orientation and interest in the material flow function are concerned. Transportation costs alone in the Purex Company amount to more than $8 million a year or approximately 10 per cent of the sales dollar. Boeing, on the other hand, pays out a fraction of one per cent of its sales dollar in transportation costs.

FIGURE 3

PRESENT ORGANIZATION OF TRANSPORT DIVISION, BOEING AIRPLANE COMPANY CONTROL OF MATERIAL FLOWS



Traffic and distribution play a major role in management of the Purex Corporation, whereas traffic is a minor function in the Boeing Company. However, if the many activities related to the material flow function could be organized under one head at Boeing, and sophisticated approaches developed for managing the material flow process, substantial cost reductions would result.

Other Applications

Many industries should be able to benefit from a Rhochrematics approach to management of their material flows. Service industries such as transportation companies tend to be operations and sales oriented. Since they are not concerned with selling a product, little thought may be given to material flows. The operations oriented company is in many respects like the production oriented organization. An important function is that of keeping the equipment in good condition so that schedules can be met.

These companies often accumulate hundreds of thousands of dollars worth of supplies and spare parts. Since purchasing of supplies and parts plus the various aspects of moving, storing, and issuing them, may be minor functions relative to the primary concern of the corporation, they may get little attention from top management. The fact that a train or truck or airplane or ship cannot move for lack of spare parts would be spotlighted for top management. In order to prevent this, all possible contingencies are planned for, resulting in multiple cushions and an oversupply of many items. Better control and integration of activities could result in substantial cost reductions.

Lumber

Bound industries also tend to be production oriented, with little attention given to company-wide integration of the material and information flows. For example, in the lumber industry when a log is moved to the sawmill it is turned over to a sawyer whose decision is all-important to the operation. Production orientation can influence his decision so that he cuts the best lumber, holds waste to a minimum. Little consideration may be given to the problems of inventory or lack of markets for the end product. Markets might be glutted with the items being produced with shortages developing for other products. Integrated management of raw materials procurement, production, inventory control, sales, and distribution has received little attention in this industry.

Agriculture

The argicultural industry could benefit substantially from an integrated approach to managing of the flows of their products, but since there is very little control exercised by any one individual over the many functions involved in the movement of material from original sources to final consumer, this would be most difficult to organize.

Other industries could be cited whose conceptualizing the total flow could prove extremely beneficial. However, the above examples are representative of the opportunities that can be tapped by rethinking along the lines of Rhochrematics.

Generalists, Not Specialists

The growing need for more scientific approaches to the management of material flows arises out of the increasing complexity of the productive effort of most large corporations. Business philosophy is gradually shifting from concern and need for trained specialists to concern and need for managers with broad perspective and knowledge of a number of related functions. The realization that substantial benefits can be derived from integrating many related functions should result in organization around material and information flows.

The complexity of these functions cannot be overemphasized. The existence of extreme specialists in management capacities in the many fragmented functions and the longstanding efforts that these people have made to professionalize such activities means that innovators will be faced with much inertia and outright resistance to change.

Many traffic managers, warehouse managers, purchasing managers, and others now hold key positions on the management team of most large organizations. Their organizations have been built over a period of years on the theory of functional specialization within the corporation.

There are very few senior people on the American business scene today who have the experience, background, or inclination to take over and manage an integrated approach to material flows. Many feel that the activities are so complex that it will take a long time to develop executives with the proper perspective. However, the tools and developments of the last few years make it possible to reorganize some of these activities in the interest of the over-all corporate objectives.

Facilitating Developments

While innovations stemming from the application of Rhochrematics are likely to come slowly because of the inherent resistance to change, there are a number of facilitating developments which should enhance the likelihood of progress. Separating, for the moment, the two basic elements of the flow process, material and information, we can trace some of these developments.

The technology surrounding the mass production process has been accelerating since the industrial revolution and a typical production line cuts across traditional vertical organizations. Attention in industries utilizing highly integrated production lines is focused on the material flow rather than upon individual functionally specialized units. As more sophisticated mechanization is introduced, the flow of material becomes more and more critical.

Automation Forces Flow Approach

Automation, with its self-adjusting controls over the manufacturing operation, also puts increasing emphasis on the flow process. Typically, the most highly automated operations are those such as processing industries, for example, milling or refining. However, automation is gradually spreading to other operations where concentration on the material flow process has not been as evident. As inroads are made via increased mechanization, integrated machine processing, and automation, management will be forced to think in terms of the flow of material through the plant. Hence, managerial control should be established along these lines.

The external movement or physical distribution of material is also undergoing a number of changes which will facilitate new approaches to the over-all problem of material flow. The elimination of handling through the use of containerization and integration of various modes of transportation is revolutionizing the movement of general merchandise as well as some bulk products.

Air freight is likely to be a new dimension in transportation within the next few years. The cost of moving freight through the air will be cut in half this year as new turbo-prop aircraft are delivered to some of the

freight carriers. Several national companies are already using this means to reach national markets from one central production facility. They indicate that elimination of regional warehouses and multiple handling more than repays the added transportation cost.

As airfreight rates are brought down closer to the levels of truck and rail, many more companies will be able to benefit from a revised approach to material flows. Such changes in the external flow of material will often allow rethinking with regard to the internal flow of materials; for example, high-speed movement of finished goods through the normally lengthy distribution pipeline will allow companies to refine production schedules and to control inventories with much less reserve.

Information Flow

While changes in the physical flow of material, both internal and external, have been progressing, some of the most startling advances have been made in the area of information flow. Systems of information flow are critical to the control of the material flow process. The advent of high speed electronic computers has allowed companies to deal with much larger quantities of information.

Fantastic speeds allow computer processing of tremendous amounts of data which heretofore were unusable. More than that, however, the computer has stimulated rethinking on the part of innovative managements with the result being sophisticated new systems of information flow. Real progress has been made where the computer has been used to process information in new and different ways rather than to process the same old data in the same old way, only faster.

High speed data transmission over leased wires or other means has facilitated the use of the computer as a processing device. The most critical problem for systems of information flow as control mechanisms has been the collection and transmission of data rather than processing. Currently, much effort is being devoted to source recording; and once this problem is solved, the goal of integrated data processing will be within reach.

The technology necessary to achieve integrated processing of material and integrated processing of data necessary for controlling the system is either on hand or forthcoming very soon. However, management's ability to utilize these technological advances lags. The organizational adaptations necessary to take full advantage of available technology are slow in coming. Such lethargy is particularly deplorable since many of the advantages or benefits could be achieved through organizational adjustments even without the technological innovations. According to Jasinski:

> "The impact of recent technological innovations has forced many managers to take a second look at their organization, particularly with the advent of modern data processing equipment. This equipment requires information in a certain form. Where managers have used it as more than simply a change in 'hardware,' equipment has triggered sweeping revisions of data processing departments. To prepare information efficiently for the processing equipment, managers have completely reorganized traditional departments. In this connection there are the telling, perhaps exaggerated, stories of

companies that revised their organizations in anticipation of delivery of data processing equipment only to realize such great savings through the reorganization process itself that they canceled their orders for the equipment."[8]

How can such benefits be achieved? How can the ideas embodied in the Rhochrematics concept be applied throughout industry?

Implementing Rhochrematics

The first and most important step in implementing a systematic, integrated approach to managing material flows is awareness on the part of top management that substantial benefit could be derived from changes in orientation. Moreover, if the Rhochrematics concept is to be applied, there must be genuine interest on the part of top management. As is the case with nearly all innovations, there will be considerable initial resistance.

Without support from the upper echelons, proposed changes are usually doomed to failure. For example, if the chief executive merely refers the subject to a committee for further investigation the odds are overwhelmingly against further action unless he maintains an active interest in the project. Committee members, particularly those with vested interests, can ordinarily marshal considerably more "why nots" than "whys."

Since Rhochrematics, the science of material and information flow, stresses the flow process, considerable attention must be given to reorganization in order that controls can be centered around this process. The interrelatedness of and interaction between the various specialized functions must be highlighted. Management attention must be focused on this problem. According to Jay Forrester, "industrial dynamics" must be recognized as an important consideration. He says:

> "Our industrial systems are becoming so large and sophisticated that a knowledge of the parts taken separately is not sufficient. In management, as in engineering, we can expect that the interconnections and interactions between the components of the system will often be more important than the separate components themselves.
>
> Managing is the task of *designing* and *controlling* the industrial system. Management science, if it is to be useful, must evolve effective methods to analyze the principle interactions amongst *all* the important components of a company and its external environment. In the same sense that we can analyze complex physical systems, so will it become possible to understand better the interactions within industrial and economic systems."[9]

Management must be willing to step back and re-evaluate its traditional organizational arrangement; it must be willing to restructure traditional arrangements in order to capitalize on the advantages that can accrue by concentrating on the material flow process. The exact nature of new organization structures cannot be pinpointed. For companies emphasizing physical distribution, the distribution manager with authority over both production and distribution might be the answer. For other companies, where the internal flow of material is a more critical problem, a different approach might be appropriate. There will normally be a temptation to impose an additional

agency to coordinate or expedite material flows. While this may improve the situation somewhat, it still does not get at the basic problems of empire building in the various functionally specialized departments. Until the concept of primary control based on material flows is accepted, little real benefit will be achieved.

Because of this problem of changing the atmosphere in the company and the attitude of traditionally oriented department heads, it seems that some fairly major innovations are called for in order to instigate a process of rethinking. While the initial stages of such an approach might create considerable turmoil, the long run payoff should be substantial. Management must take some giant strides in the near future if its organizational adjustments are to keep up with technological advancements.

Summary and Conclusions

Rhochrematics literally translated means the science of product or material flows. The term is connoted to mean scientific or systematic approaches to the management of material flows.

Any system is made up of a number of sub-units or operations all of which perform functions of major or minor proportions. Any of these functions might be performed independently in optimal fashion, but not necessarily in the best interests of the system as a whole. Focusing attention on the material flow process enhances the probability of optimizing the whole system rather than its separate parts.

Over the years, various aspects of the management of material flows have been receiving increased attention. Some companies have recently taken an integrated approach to the basic subfunctions of the total material flow process, production or distribution. More and more attention is being given to "distribution management," "materials management," "industrial logistics," "landed costs," or other segments of what might be called a total systems or Rhochrematics approach.

Organization theorists and practitioners have paid little attention to proposals for bringing all of the activities related to material flows under one head. Traffic, inventory management, in-plant transportation, production planning, receiving, storing, and shipping are functions that are often analyzed separately in relatively isolated departments of any one company.

In the past there was little reason to consider a systems approach to the performance of these functions because there were few alternatives and standard straightforward approaches sufficed. In recent years these activities have been complicated many times over by production of many new products, models, sizes, colors, and other variations. There are many new alternatives in transportation that did not exist even 20 years ago; for example, the long haul private, contract, or common carrier truck; "piggy back" and many other innovations in containerization on land, sea, and in the air; and the rapidly developing air freight industry with its promise of much lower rates and improved service.

The revolution that is now going on in information gathering, transmission and processing provides new dimensions for managing material flows. Growing sophistication in the field of management sciences holds excellent promise for developing even better tools for handling and combining the data that must now be used in Rho-

chrematics. Analyzing the data with simple machine techniques is useful; the application of operations research techniques can prove helpful; and simulation of the material flow process seems to offer additional promise.

Top management must become interested in the Rhochrematics approach before any progress can be made. A thorough study of company goals, plans, programs, and organization will reveal the possibilities for integrating activities related to the material flow function. When such activities are fragmented in different organizational units, there is no way to even approach maximum results.

In the final analysis, serious consideration must be given to adjusting the organization of the company so that many of the interrelated functions become the responsibility of one executive. This executive must be well trained, imaginative, and broad enough in his orientation to make a complex total system function optimally.

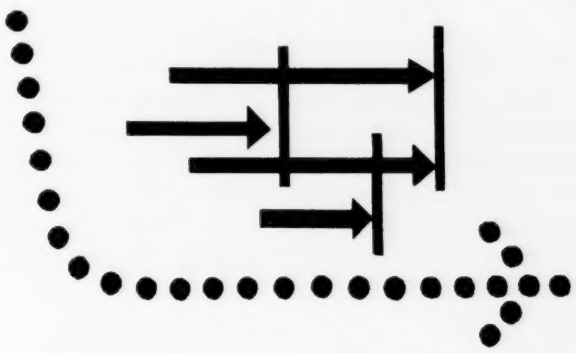
REFERENCES

1. See Stanley H. Brewer, *Rhochrematics* (Seattle: Bureau of Business Research, University of Washington, June 1960), 30 pp.

2. John M. Pfiffner and Frank P. Sherwood, *Administrative Organization* (Englewood Cliffs: Prentice-Hall, Inc., 1960), pp. 14–15.

3. Frank J. Jasinski, "Adapting Organization to New Technology," *Harvard Business Review*, January–February, 1959, page 80.

4. Jay Forrester, "Management and Management Science," Unpublished Paper, copyrighted by Dr. Forrester, School of Industrial Management, Massachusetts Institute of Technology, p. 7.



When a corporation "goes public" and seeks capital through sales of stock, management acquires not only a whole new set of bosses, but vastly increased responsibilities and must fulfill its duties as if administering a public trust.

MANAGING A PUBLICLY OWN

LEO A. WEISS

For the past thirteen years, Leo A. Weiss, who is now just 41 years old, has been President and Chairman of the Board of Avien Inc., manufacturers of instruments, controls, and major systems for aerospace and undersea use. He has also been an officer in the Young Presidents Organization. His firm became listed on the American Stock Exchange in 1959, so he speaks with authority on the factors involved when a corporation "goes public."

IN 1960, a large number of companies "went public." Companies of all sizes and types, the majority of them had little in common, except their newly acquired public ownership—and a new set of duties made mandatory by their altered status.

Most of these companies, I am sure, are generally well aware of their duties as publicly owned organizations. But there is one area of "duty" to which I believe many companies could pay more attention: the duty to their stockholders.

I am not referring to what is commonly called "stockholder relations." Because of the broadened base of investorship since World War II, almost every company is cognizant of the need to maintain good stockholder relations via such devices as informative and readable annual reports, periodic communiques to stockholders, more accessible annual meetings and revelation of more operational details.

What is being referred to is an area I would like to call "the implications of stockholder duties."

Broadly defined, the phrase "implications of stockholder duties" refers to the manner in which management conducts itself for the best interests of the shareholder group.

CLY)WNED CORPORATION IS A PUBLIC TRUST

Because of the increased emphasis on stockholder relations in recent years, many companies have tended to feel that they are adequately discharging their "stockholder duties" if they establish a good stockholder relations program.

"Keep the stockholders informed."

"Let's make sure we have a good communications program to our stockholders."

"Give them a feeling they can query management whenever they want to."

The above utterances, in the opinions of many managements, appear to constitute the beginning, the middle and the end of their duties to the stockholders.

But this can't be so. Management's responsibilities to its stockholders, the implications of the duties that management must carry out on behalf of its stockholders, must go much further. In fact, the implications must permeate the entire conduct pattern of the management.

There are ten basic implications of stockholders' duties that the modern, responsible management must be aware of, and on which it should act.

Know Thyself

As soon as a company "goes public," the management has many added responsibilities as a result of the increased ownership.

One of these responsibilities must be a realization on the part of management that there is no room now for muddled decisions, lack of clear-cut policy, and an absence of knowing exactly where the company is going.

In a privately held concern, the number of persons who can be injured by poor planning is minimal. But with public ownership, this number increases greatly. Consequently, the need for establishing and maintaining

a clear organizational direction is mandatory.

In order to have this clear direction, it is necessary for management to adhere to the old admonition, "Know Thyself." Management must lucidly set forth its policies, goals, capabilities and the like, because it is from these basic codes that the success of the company will flow.

If the company does not know itself thoroughly, mistakes will constantly occur because decisions will be made on erroneous assumptions. Needless to say, such errors, which will be harmful to the company, will be harmful to the shareholders.

Equally important as a facet of the "know thyself" circumstance is the need for management to transmit these facts to its shareholders. What are the company's policies? What goals does it have? What are its capabilities? These are questions to which the shareholders are entitled to have an answer.

Managements will soon find that making these facts known to the shareholders actually will be of great benefit, because informed stockholders usually are satisfied stockholders. True, they will become disturbed if circumstances in the company are not good. But even in situations of this type, the stockholders who have continually been given access to the facts will create less difficulties for a management than will stockholders who have always been kept in the dark.

Education of Management

"There are new owners in the business now."

This thought, and everything that it means, must be clearly brought out, presented to, and imbedded into the minds of all levels of management.

Except for top management, the switch to public ownership may appear to have little real importance or impact on the management personnel of the company. Their day-to-day duties seem to go on the same as before, regardless of whether the ownership is in the hands of a few people or a large number.

However, this actually is not the case. Whereas before there was public ownership, the decisions that managers made affected only a relatively few persons, a great many more persons now have a stake in the results of these decisions.

The promulgation of the "there are new owners in the business now" attitude is important because it provides all levels of management with a frame of reference within which to operate. Henceforth, management personnel actions and decisions must be carried out within this frame of reference that acknowledges the presence of a responsibility to a broad group of owners.

It should be obvious that initiation and shaping of this "other ownership" thinking must be the responsibility of top management. After all, we are speaking now of a policy for operation. And policy making decisions necessarily must come from top management.

Implementing New Policy

What can top management do to implement this new philosophy? The avenues are many.

First, for at least six months prior to a public offering, top management should conduct an intensive education program at all levels of management. This program should be designed to explain why the company is "going public," and what this means.

Emphasis should be placed, not on the obvious reasons for public ownership such as increased capital opportunities. Rather, the emphasis should be on the increased responsibilities that the company is assuming because of the much broader group of new "owners."

Such orientation should continue for as long as necessary after public ownership is attained. At every possible opportunity, top management should refer to the change in ownership status, and should emphasize the meaning of this new status.

Valuable means for carrying out the orientation include management seminars, the company house organ, special management communiques, and referral to the new status during the working relationships that top management has with the other management levels.

It is interesting to note, too, that top management's endeavor to instill the new philosophy will pay off in handsome supplemental dividends.

One of the most important of these will be an increase in personnel morale.

"Going public" is a sign of company growth and achievement. It is an obvious milestone in the development of a company. It signifies that the company has become an important enough organization so that a great many people are willing to spend their money to become a part of it.

Most of us take pride in belonging to something that other people want to join. This, of course, is also true of company personnel. Consequently, when top management continually stresses the broadened public ownership of the company, it will increase the over-all morale of the organization.

Utilize Qualified Financial Counsel

Expert outside financial counsel is expensive, and rightly so, because it is extremely important to the future success of the company.

In the market place of financial counsel, as in the market place for all other services, there are many grades of "goods." And the maxim holds true that "you get what you pay for."

Responsible managements must realize this fact. When capital is tight, as it is with most companies planning to go public, there is always a desire to economize.

But management can never afford to economize on its financial counsel for its own good, because "its own good" means the eventual good of the stockholders. Financial decisions made early in the life of a publicly owned corporation will affect the future success of that company. Errors will be magnified as growth proceeds, whereas wise initial planning will pay off handsomely.

When shareholders invest in a company, they expect, and are entitled to, the finest available financial counsel in the management of their equity. To give them anything less than this is to fail in a major implication of management's duty to its shareholders.

The company that does not try to economize on such counsel also benefits in another way. How often are we judged "by the company we keep." In the financial world, where the opinions of analysts, brokers, bankers and others are so important to the moulding of the over-all reputation of a company, many an organization has benefited because it is associated with recognized, able financial counsel.

On the other hand, the company which has stinted in this area will re-

ceive far less favorable reaction. Such a company will find it more difficult to deal in the financial market place, to raise capital, and to maintain a good image of itself in this most important opinion making spectrum.

The Right Publicity

In the coming years, as never before, American companies will require ever greater sources of capital. As Mr. L. E. Pettit, Manager of Investor Relations Service, General Electric Company, said in a recent speech before the American Management Association, "American industry over the next ten years faces a productivity challenge that can be met only through a sharp acceleration of the rate of capital investment in comprehensive programs of mechanization and automation."

This sharply increased need for capital necessarily means that competition for available capital will also increase in the coming years. Those companies most qualified and best known will have the easiest time obtaining their capital, while the lesser known, less qualified companies will have a more difficult time.

Therefore, it behooves management to cultivate actively the financial community. Again, doing so helps insure the future success of the company, and represents a carrying out of another implication of management's duties to its stockholders.

When we say that management should "cultivate the financial community," we are thinking in terms of a carefully planned program for making the company, and its capabilities, well known in financial circles.

Unfortunately, many company managements, especially those of smaller, relatively unknown companies, have not yet realized how important such a program is.

In Avien's case, we did realize the need for this program and it was put into effect at the time of our listing.

Top Level Liaison

This program has been operating at many levels. The primary level is "at the top," and includes meetings with key personnel in investment houses and banking institutions. Here, by the way, is one example of where employment of expert outside financial counsel pays off. Representation by such counsel has helped us to achieve a liaison with these key personnel.

A second level of liaison was established with the security analyst portion of the financial community. As the body of stockholders grows, along with a broadening in the number of publicly owned companies, the stature of the security analyst is also growing. More and more, he is becoming a key figure in the assessment of a company's reputation in the financial community. Consequently, it is imperative for new, publicly owned companies to introduce themselves to these security analysts.

We have handled this introduction in two forms: individual meetings with security analysts, and small, informal luncheon meetings with groups of analysts.

Meeting the Security Analysts

We have found such meetings to be highly productive in terms of making our company better known in the financial community. I believe this can best be illustrated by what one analyst told me after we had a meeting with him. "I always welcome the chance to meet personally with top management. Figures don't always tell

the true story about a company. I also want to know something about the persons running the company. It gives me perspective and helps me make a better analysis of the organization."

A third means of making the company better known in the financial community is through the medium of the business press. The editors of these publications are as adept and knowledgeable about their particular fields of interest as are the analysts. They, too, welcome the opportunity to meet with company managements. In many cases, this holds true even when no specific story is expected. Naturally, the privilege of meeting with an editor for a get-acquainted session should not be abused because these persons essentially are out after a story. But we have found that if they are forthrightly approached on a get-acquainted basis, they usually are agreeable to it.

Stockholder Reports

And finally, a carefully planned program of mail communications to the financial community is also helpful for making the company better known. Quarterly reports, reprints of information, various communications to stockholders—these should also be sent to predetermined members of the financial community as a means of keeping these persons better informed about the company.

The cumulative effect of these and other activities in the same vein will make the company better known, and favorably so, to the financial community. They definitely do contribute to solving management's task when it becomes necessary to approach the financial community for capital and other aids required for the continued success of the company.

Since the cultivation of this atmosphere is so important to the future success of the company, it can be readily seen that it is the duty of management to carry out this function as one of the implications of its responsibilities to its stockholders.

Appropriate Public Statements

A company president, speaking publicly, in a sense speaks for all the stockholders. What he says will in one way or another affect the present or future of his company, and this means the interests of the stockholders.

Consequently, the company president, and his top management, must realize they have a duty to their stockholders to say just the right thing in their public utterances.

This can be an especially delicate situation. There is much room for misinterpretation of statements today because so much attention is being paid to the stock market with its attendant speculation, rumors and tips.

Misinterpretation can bring about a number of damaging results such as exploitation of the value of the stock out of all proportion, eventual impairment of the reputation of the company as an honest, forthright organization, and creation of a generally "wrong" impression about the company to its various publics.

Because of these possibilities, managements must be especially mindful of their public utterances. This is not to advocate a falsification of facts. Such a practice will catch up with a management sooner or later, and to the detriment of the company and its stockholders. But it does mean that public statements should be carefully prepared and presented in a manner that is concise and unmistakably clear in intent and meaning.

An honest approach to the public utterances by company officials is the best approach, not only because of its basic moral right, but because it will of itself minimize the breadth of area for misinterpretation.

Stick to Facts

Facts are facts. If they are presented clearly, they will not be open to too much misrepresentation. It is only when companies, too eagerly intent on creating a "good" impression, issue cloudy and vague statements that the opportunity for misinterpretation is increased.

There is also another benefit that accrues to managements when they carefully plan their public statements and make them in a clear, factual and concise manner. This is the benefit of realizing the greatest potential of what they say.

For example, if your statement deals with good news that can help the company's reputation, it usually will receive a full and careful airing in the financial community based on the goodwill you have engendered through past honest statements. Or, if what you have to say is not so favorable, a poor earnings statement perhaps, your reputation for honest, forthright past utterances will stand you in good stead.

An editor best summed up this point to me following an interview. He said, "We won't distort the news, certainly. But if a company has bent over backwards to be honest, and to give us all the facts on "good" news, when information that is not too favorable to the company must be published, we also will bend over backwards to give the company officials an opportunity to explain the situation and describe the extenuating circumstances."

It can be seen, therefore, that when sticky situations do occur, a reservoir of goodwill is very welcome, indeed. It will help the company, and by doing so, will benefit the stockholders, creating a further instance of management properly carrying out one of the important implications of its duties to its stockholders.

Spare Expense on Stockholder Relations

At first glance, this particular implication of management's responsibilities to its stockholders appears to be a statement of paradoxes.

If good stockholder relations are so important, why should this be an area for sparing expense? The answer lies in the realistic manner in which managements should discharge their stockholder relations programs.

Earlier in this article, we noted that the function of stockholder relations has received much emphasis in recent years because the shareholder base has broadened so greatly. It is proper, of course, that stockholder relations programs should be emphasized and should be keyed toward keeping stockholders well informed.

But the danger lies in the manner in which many companies carry out their stockholder relations programs.

Too many companies try to emulate the few, huge companies in the extent and expense of their stockholder relations programs as a means of "putting their best foot forward." And often, their idea of putting their best foot forward means producing expensive, overdone annual and quarterly reports, communications to stockholders, expensive annual meetings, etc.

In our opinion, this approach negates one of the primary implications of management's responsibility to

its stockholders, the wise and prudent administration of the shareholders' equity.

Stockholders should be kept fully and frequently informed on the activities of their company. But managements should pay more attention to doing this within a realistic expense limit.

A good and effective stockholder relations program can be carried out inexpensively. In our case, for example, we have been able to turn out quarterly reports at a relatively negligible cost by adopting a uniform format with a minimum of elaboration. The same has held true in the development of special reports to stockholders which we frequently disseminate as a means of keeping them informed between quarterly reports.

Perhaps the key yardstick here is to consider this fact: it is more important what you say to the stockholders than in what visual form you present it. Almost every stockholder will resent his money—and it truly is his money—being spent on elaborate brochures and presentations. He wants to know about his company, and he welcomes periodic mailings of information. But he would prefer to receive this information in a plain, intelligent manner rather than have it garnished with a lot of expensive dross.

Answer Queries Frankly

We mentioned earlier the need to make the company better known to the financial community. But the "open door policy" is something else again.

Frequently, especially if something significant is happening at the company, inquiries will come in from members of the financial community. These should, and must be, promptly and forthrightly answered. Failure to do so may lead to conjecture and supposition on the part of the financial community. In turn, this may result in the possibility of erroneous information being developed that can affect the stock of the company with an ultimate detrimental effect to the equity of the stockholders.

In the handling of inquiries from the financial community, many company top managements, especially those of smaller organizations, complain that "we could spend all day answering inquiries. We just haven't got the time to spare."

We all recognize that top management can get into a time trap in this respect. One way of avoiding this, however, may be by using a method we have employed. It has worked well for us.

Initial inquiries are channelled through our public relations personnel who will answer the questions if possible. But if public relations feels the answers must come from top management, they will either obtain these answers for transmittal to the inquiree, or arrange for a member of Avien's top management to call the person by phone.

This arrangement enables us to handle many inquiries quickly and to everyone's satisfaction. But the most important value lies in the fact that analysts and other persons especially interested in Avien have gotten into the habit of "checking out" with us any rumors they have heard about the company. In this respect, our "open door policy" makes it possible for us to make sure our "side of the story" always is told—and told correctly.

In conducting an open door policy, it is also important for managements to adhere to a single standard and not play favorites in giving out informa-

tion. Each financial community inquiry should be answered in the same way, providing the same amount of information.

Of course, if one analyst does a better questioning job and comes away with more information, he should not be penalized. But on similar inquiries from different sources, equal information should be disseminated. Failure to do so will destroy the validity and value of the open door policy.

When Not to Declare Dividends

In financial policy, wise management must not be too greatly influenced by stockholder considerations.

Initially, this may seem like a heretic point of view in a discussion of the implications of management's responsibilities to the stockholders. But it isn't.

What we are talking about now is the too frequent attitude of management that "we just have to maintain our record of uninterrupted dividend payments to the stockholders," or, the idea that because the company has a good cash position, "the stockholders will kick if we don't give them a bigger dividend."

A management thinking along these lines runs the danger of carrying out unwise dividend practices—at the expense of the future health of the company. It's nice to declare dividends. But, have sufficient funds been put aside for depreciation? Do we leave ourselves in a weak cash position by declaring this dividend? These are some of the questions management must ask itself.

In this area, perhaps more than in many others, management must be strong in standing up to possible stockholder demands for the ultimate good of the stockholders. Failure to do so is an example of failure to meet the implications of stockholder duties.

You've Got to Make a Profit

In the mass of advanced sociological thinking prevalent now-a-days, much is heard about a company's social responsibility, about its duties to the community and to its workers. And frequently, if the profit motive is mentioned at all, it is in hushed tones. There seems to be something unsavory about profitability.

I firmly believe this to be wrong. A company is in business for many reasons, including its social responsibility, its duty to its employees and the community. But the most important and primary reason for a company's existence is to make a profit, to create a situation of profitability for its shareholders.

Companies will vary in their approach to maintaining profitability. And this is just as well, because each company is a separate organism with different means for obtaining profitability.

But, all of these companies have one thing in common. It is their duty to their stockholders to work for profitability at all times. And managements should not be reluctant to assert publicly that this is their prime function.

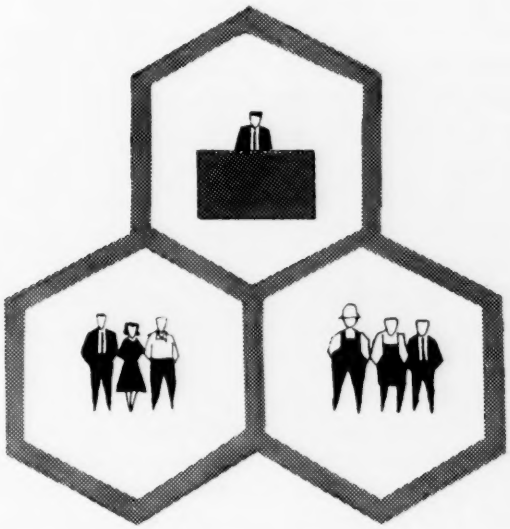
In considering their duties to the stockholders, managements must continually relate all activities to the profit motive. Whatever decisions they make, whatever policies they follow, all must be based on the assumption that profitability is the basic goal. It should be evident that only through profitability will the company be discharging its ultimate duty to its stockholders, that of providing a profit to the owners who have invested in the organization.

"Prudent Man" Attitude

The final implication of management's responsibilities to its stockholders is really a broad, over-all "attitude" that management should implement in its operations.

In financial trust management, reference is often made to the "Prudent Man" who is expected to function at all times on behalf of the trust interest for which he is responsible. Managements would do well generally to adopt this "Prudent Man" approach in the conduct of their business.

This is a far reaching implication of duty to the stockholders. It covers not only the financial management of the corporation, but every other activity of the organization insofar as it affects the present and future well being of the firm. It includes imaginative future product and market planning with built-in flexibility to meet technological and economic changes, building the management team and making provision for the training of future managers, sound, long-range financing, the creation of a favorable corporate image, and the many other elements necessary in the best interests of the stockholders for whom management holds a trust.



A SIMPLIFIED CAPITAL BUDGETING APPROACH TO MERCHANDISE MANAGEMENT

RICHARD H. HOLTON

Perhaps the traditional Controllers Congress measures of a good merchandising operation need re-examining. For, after all, profits are more precious than markup and a stock turn based on loss leaders puts no black ink on anybody's books. Capital budgeting based on contribution-return on inventory investment provides a new approach which could maximize profits.

Dr. Holton, Associate Professor of Business Administration at the University of California, Berkeley, is the co-author of two books on economics and marketing and author of several articles on various aspects of distribution. At present he is preparing a monograph on the Census of Business for the Social Science Research Council.

The rationalization of decision-making in the manufacturing sector of the economy in recent years has advanced at a pace which most retailers have apparently been unable to match. Manufacturers have been making increasing use of such devices as mathematical programming of production to make optimum use of equipment; application of the theory of inventory controls to give the economic order quantity and optimum stock levels; and capital budgeting to assure optimal use of funds.

Although a handful of large retailers are experimenting with the application of modern control techniques, these advances are clearly neither so numerous nor as significant in retailing as in manufacturing. It may not be an exaggeration to say that in the modernization of decision-making techniques, the race between manufacturing and retailing thus far has been a case of the hare and tortoise.

We need not search far for the roots of this disparity. First of all, successful retailing has always called for more artistry than has successful manufacturing. Contrast the manufacturing of a television set with the retailing of that same television set. The manufacturer faces a limited number of alternatives in the design and pricing of the product; and he produces several combinations of design and price so that he may meet a high proportion of the consumers' preferences. Once this decision is made, he then produces to specification in the most economical way (until the next model change). Thus, there is great emphasis on cost control.

The retailer of television sets, on the other hand, attracts customers to his television department not simply because of the price and design of the sets he displays, but because of countless other features of the store. Customers are attracted by other departments, by special promotions, by the nature of the advertising, by the appearance of the store, by the courtesy of the clerks, credit plans, delivery service and so forth. Just what combination of all these features will

prove most appealing to consumers is very largely a matter of insight developed from experience.

Management by Hunch

The effect of changes in any of these policies is difficult to quantify, and the effect of any such change may be different from one month to the next. The number of relevant variables and the difficulty of quantifying them seems, in the case of retailing, to have led to management largely by hunch and intuition. Furthermore, the retailer in so many instances handles such a huge number of items (10,000 or more, for example, in many supermarkets) that careful application of quantitative techniques to each item would be prohibitively expensive.

A second reason for the lag in the application of more modern methods to retailing often rests on the simple fact that the number of employees per firm is so much greater in manufacturing than in retailing. One of the virtues of greater size is, after all, the specialization of managerial talent which it permits.

So in manufacturing we would expect to find, as a rule, more specialists in different phases of management than would be the case in retailing. Of course, the largest retailers in the country are large even by manufacturers' standards. But, even in large-scale retailing, size is achieved in a relatively unique manner, namely by joining together comparatively small units (branch stores or departments) which are in many respects autonomous managerial entities in which managerial specialization is limited.

The retailer's stress on merchandising tactics can in part be explained by the cost conditions he faces. His expenses are largely fixed in the short run, so his profit position is determined primarily by his sales. The manufacturer, on the other hand, faces quite different cost conditions. If his sales slow down he can reduce his work force or close down completely for a few weeks while he sells from inventory. But the retailer's work force produces a service, viz., the service of waiting on customers, and this service cannot be produced for inventory if people happen not to come into the store on some days.

Retailer Has High Fixed Costs

True, the retailer may vary his sales force so that it fits the expected pattern of sales, but the point is that the retailer first decides on the size and distribution of his sales force, then he hopes that customers will come in so that his clerks can produce service. Little wonder, then, that the retailer historically has been somewhat more volume conscious than has the manufacturer. The manufacturer, who can match costs to output much more readily than can the retailer, has laid more stress than the retailer on cost control.

The far greater density of trained engineers in manufacturing is probably another part of the explanation. The engineer, accustomed to a rational, pragmatic approach to manufacturing problems, is predisposed to work with quantitative information and with production, rather than sales, problems. But in the mind of the merchandiser or salesman, by contrast, customers take precedence over costs. Retailing, involving almost no physical transformation of the goods handled, is rarely in need of an engineer. The merchandiser's outlook, rather than the engineer's, obviously prevails, and for good reason.

"The Customer Comes First"

This contrast may be overdrawn a bit, but surely it exists nonetheless. It is true, however, that retailers have been taking certain steps in recent years to narrow this gap. After the war the Controllers' Congress of the National Retail Dry Goods Association, now the National Retail Merchants Association, appears to have taken the first major steps toward a more rational approach to retail management procedures.

The downtown department stores' postwar difficulties with the discount house on the one hand and the suburbanization of retailing on the other unquestionably were influential in motivating major metropolitan retailers to sharpen their pencils and examine their costs and operating methods more carefully. The result was the now famous Standard Expense Center Accounting technique for allocating costs to centers within the store.

The individual in charge of each center could then be charged with the responsibility for keeping his controllable costs in hand. More recently, at least one version of merchandise management accounting has been built on the expense center cost approach to give a means of allocating controllable costs to individual shipments of goods so that the contribution to overhead and profit can be ascertained for that item, assuming various prices.[1]

In both expense center accounting and merchandise management accounting one finds a heavy emphasis on the allocation only of controllable costs, i.e., costs which would not have been incurred if the decision in question had not been made. For example, in merchandise management accounting a shipment of goods is allocated only those costs which would not have been incurred if that shipment were not bought.

The difference between this incremental cost and the net sales value of the item in question yields the contribution to overhead and profit associated with the shipment being considered. This is nothing more than an application of the incremental (or, to the economist, marginal) analysis. The emphasis on the contribution to overhead and profit has been developing gradually over the years and now seems to be reasonably well established in the thinking of at least the more progressive retail store operators.

Gross Margins and Profits

Despite the growing acceptance of the contribution to overhead and profit as a basis for certain types of merchandising decisions, there can be little doubt, as McNair and May point out, that retailers still lean primarily on other indices of performance.[2] Too often these indices are gross margin percentages or other ratios to sales, which ratios of course have only an indirect relationship to dollar profits.

Information on "typical" ratios for different types of retailing is rather widely circulated via the trade journals and of course the firm will have its own historical ratios. Retailers often then find themselves using the historical ratios, qualified a bit by the industry-wide ratios, as goals. The possibility that the historical or "typical" ratio may not be the best one seems to be examined less often than one might expect it to be.

There can be little question that the practice of applying set mark-ups almost automatically left some types of retailers very vulnerable to new competition which was taking another look

at cost and demand conditions. But this is a complaint against nearly all automatic means of computing markups, not just the particular one which has been employed historically by so many retailers.

How might the performance of a department be evaluated and compared with other departments? How might the performance of one line within a department be compared with other lines? These are clearly two of the most troublesome questions for the retailer as he considers his control methods. If the weak departments (or lines within departments) could be spotted readily, then they could be contracted or eliminated if improvements in performance could not be achieved by any of the more common merchandising remedies such as alterations in display, promotion and so forth. If the strong departments can be identified easily, then they might profitably be expanded at the expense of the less successful departments. And perhaps new departments should be introduced.

"We Love That Markup"

But the usual measures of performance are poor guides for this sort of decision. For example, one food chain executive, clearly perplexed by the problem of deciding whether the firm's supermarkets should introduce soft goods departments, said that the company policy is to leave the decision to the individual store manager since the firm has no answer to the problem. "We love that markup," he said, "but we hate that turnover." The management had not determined a means of reconciling these two measures of performance.

The argument of this article is that these troublesome questions can be answered simply and with tolerable accuracy if the problem of achieving a profit-maximizing balance among merchandise departments is viewed basically as a problem in capital budgeting. Considered in this way, a number of the nagging problems in retail store management are put in a new and, it is hoped, helpful light.

We shall first spell out the argument that the capital budgeting approach calls for maximizing what we will term the "contribution-return on inventory investment." Then this approach to the problem of merchandise management will be applied to an illustrative case. Finally, certain of the policy problems implied by this approach will be discussed.

Capital Budgeting an Answer

It should be stressed at the outset that the capital budgeting approach to merchandise management is not really new. The idea of viewing the contribution to overhead and profit as a return on inventory investment has been ducking on and off the stage in a nonspeaking role for some time. But it is the contention here that it should spend much more time down-stage center and be given star billing as well.

For the sake of simplicity, we will assume that the retail firm is interested primarily in maximizing dollar profits. Although in reality the retailer may be interested in certain other goals as well, presumably the rational procedure for the design of marketing policy in this context would call first for identifying the profit-maximizing policy, then altering that policy insofar as is necessary to bring it into conformity with any other goals of the firm which may conflict with profit maximization.

Profits Are Better Than Markup

We are concerned here only with the design of the profit maximizing policy. This emphasis on profit maximization is undoubtedly far less common in retailing than it might be. McNair and May have noted the retailer's fondness for achieving a certain realized gross or net profit percentage when they say that attention has been "focused on ratios to sales rather than on dollars, and the convenient percentages have become crutches."[3] In this paper we will keep this goal of maximum dollar profits firmly in mind.

Can any of the well-known measures of departmental performance (or performance of a line within a department) be used by itself as an index of profitability? As every retailer is aware, the answer, of course, is "no." If Department A has a higher realized gross margin percentage than does Department B, A's total sales may be so low as to make it far inferior to B.

Conversely, Department B may have a far higher turnover than does A, but whether this makes B the better department depends on the price and the costs in Department B; after all, turnover in many instances could be maximized by selling below cost. Sales per square foot is a measure commonly used to compare departments; but the department with the highest sales per square foot may also have very high costs per square foot. And sales per square foot could be increased almost indefinitely if promotional expenditures for that department were continually increased, but of course at some point these promotional expenditures would exhaust the dollars of margin provided by that department. Obviously, the sales criterion is inadequate.

More recently dollars of gross margin per square foot have been mentioned as a guide. But in some departments the cost of generating a dollar of gross margin per square foot is much greater than in other departments. Surely, selling costs, delivery and credit costs and the like vary substantially among departments in stores of any size, making for "low cost" dollars of gross margins in some departments, and "high cost" dollars of gross margins in others.

This weakness can be corrected at least in part by deducting from the dollars of gross margin in each department the direct operating costs, giving the contribution dollars ("controllable profit") per square foot. But even this measure is incomplete, for it fails to recognize that different amounts of investment in inventory are required in different department or lines within departments to generate the contribution to overhead and profit. This suggests that the dollars of contribution *expressed as an annual percentage return on the inventory investment*, may be the best available all-purpose criterion of performance of the individual department.

Contribution-Return

This contribution-return on investment, i.e., the dollars of annual contribution per dollar of average inventory investment, has much to recommend it as a criterion of performance. Its greatest virtue is that it reflects the rate of sale, the turnover rate, the gross profit percentage, the direct costs of handling and the dollars tied up in inventory investment. If the turnover increases, obviously the contribution-return on investment is increased. If the gross margin is increased, and the number of units sold per time period

remains unchanged, the contribution-return is increased. If sales are increased, the contribution return will not be altered unless the sales increase proportionally more than the average investment and the direct costs of selling the merchandise. If selling costs rise, the contribution-return on investment falls. If any of the direct operating expenses increase, the contribution-return falls. All of the common criteria of performance, except those including floor area as a factor, are reflected in this one measure. The reason for omitting area considerations from the contribution return on inventory investment will be taken up later.

The full scope of the contribution return on inventory investment can be seen most clearly, perhaps, in symbolic terms.

Let:

C = contribution as a percentage return on inventory investment

S = net sales in the given department

W = net invoice cost of goods sold by the department

D = direct expenses for the department

I = average investment in inventory in the department

Then:

$$C = 100 \times (S - W - D)/I$$

Turnover is W/I; if the percentage markup is held constant and turnover increases, $(S–W)/I$ increases, raising C. Since the realized gross margin percentage is $(S - W)/S$, an increase in this percentage, whether achieved by increasing S or decreasing W, increases C. And of course a reduction in direct expenses decreases the value of D and therefore increases C. Thus it seems apparent that the contribution-return on investment brings these common measures of departmental performance together into a single index.[4]

Is the maximization of the contribution-return on investment for all departments combined, i.e., for the firm, identical with profit maximization? The answer is in the affirmative *if* one assumes that the amount of investment is fixed. If this fixed investment assumption is dropped and the capital invested in the firm is increased, one would expect an increase in profits which is less than proportional to the increase in investment. (This assumes that the most profitable uses of capital have already been exploited.)

Here the dollar profits would be increased while the return on investment would decrease and profit maximization would not yield the same solution as maximizing the return on investment. But if the investment in the firm is fixed, any increase in dollars of net profit brings a proportional increase in the percentage return on investment.

Maximizing Return

Therefore the retailer may choose to focus on maximizing return on investment, if he wishes, without departing from the profit maximizing goal *if* he realizes that this proposition holds only if investment funds are taken as given. The analysis which follows can easily be extended to fit the case in which the investment funds are not fixed.

Is maximizing the return on the firm's investment in inventory consistent with profit maximization? A retailer's investment funds might be shifted out of buildings, say, by means of a sale and lease-back arrangement, the funds being put into inventory. This could result in greater dollars of net profit but a lower return on invest-

ment in inventory. In other words, the dollars of net profit might increase by a smaller proportion than the investment. But if the investment in inventory is given, profit maximization is in fact identical with maximizing return on inventory investment.

With a given investment in inventory, then, profit maximization calls for maximizing return on that inventory investment. Since the retailer's fixed (unallocable) costs are a constant in the short run, maximizing profit can be achieved by maximizing the contribution to overhead and profit expressed as a percentage return on inventory investment. Thus with a given investment in inventory, those investment funds should be allocated among departments and among goods within departments so as to maximize the contribution to overhead and profit per dollar of inventory investment.[5]

An Illustrative Case

We can now proceed to apply this criterion to an illustrative firm and to compare it with the other criteria commonly used. The firm, a student book store, offers an excellent case for the purposes of exploring the problems of applying the capital budgeting approach for several reasons. Not only are the accounting records readily available; the store is also big enough to have the departmental balance problem without being so large that compilation of the data is troublesome. Also, the fact that it is primarily a book store focuses attention on the familiar problem of the treatment of the department which appears to be performing poorly when viewed by itself but which may be the primary reason for the store's existence or in some degree a "leader" or "traffic-builder" department.

Selected operating data for the store are given in Table I. Let us assume that the direct expenses are allocated correctly to the various departments; Table II, computed from Table I, simply shows the rank of each department by the various criteria of performance.

Two major points are immediately apparent in Tables I and II. First, by any of the criteria shown, the performances of the various departments vary widely. Secondly, no individual department is consistently best or worst among the six.

Needless to say, the department which ranks high in turnover rate is also likely to rank high in sales per square foot, dollars of gross margin per square foot, contribution per square foot and contribution per dollar of investment; but all the percentage of sales criteria are correspondingly low. As every retailer recognizes, a department with a relatively high turnover shows a relatively low percentage gross margin in part because the turnover is high.

The contribution-return on inventory investment is highest for the candy, tobacco and magazines department, turnover being great enough to offset easily the low gross profit percentage. Books also carry a low gross profit margin, but the turnover, though second among the six departments, is nevertheless so low that the contribution as a percentage return on investment is also very low. The wide variation among the common criteria of performance underscores the necessity for a simple measure which combines the usual criteria into one.

Policy Implications

One's initial reaction to Tables I and II is that this book store should

TABLE I

SELECTED OPERATING DATA FOR ILLUSTRATIVE STORE, BY DEPARTMENT

	Unit	Total	Books	Loose Leaf	Social Stationery	Sporting Goods	Candy, Tobacco and Magazines	Fountain Items
Sales	$	966,332	662,762	97,889	72,340	51,667	50,786	30,888
Per cent of total	%	100.0	68.6	10.1	7.5	5.3	5.3	3.2
Gross profit	$	244,277	138,157	43,026	25,304	14,977	12,583	10,275
Direct expenses	$	128,720	86,367	17,601	13,087	2,940	5,851	2,874
Contribution	$	115,557	51,790	25,425	12,217	12,037	6,687	7,401
Overhead expense	$	34,010	57,960	14,843	10,076	3,584	4,356	3,191
Net profit (loss)	$	21,547	(6,170)	10,582	2,141	8,453	2,331	4,210
Square foot	sq. ft.	6,483	2,999	2,084	1,700	800	200	500
Average investment	$	219,604	160,876	27,828	28,351	15,244	5,275	10,381
Sales per square foot	$	149.06	220.99	46.97	42.55	64.58	253.93	61.78
Gross profit percentage	%	25.2	20.8	44.0	35.0	29.0	24.7	33.3
Net profit percentage	%	2.2	(0.9)	10.3	3.0	16.4	4.6	13.6
Dollars of gross profit per sq. ft.	$	37.68	46.07	20.65	14.88	18.72	62.69	20.55
Turnover rate	%	3.3	3.3	2.0	1.7	2.4	7.3	2.0
Contribution per square foot	$	17.82	17.27	12.20	7.19	15.04	33.44	14.80
Contribution percentage of sales	%	12.0	7.8	26.0	16.9	23.3	13.2	24.0
Contribution per dollar investment	$	.53	.32	.91	.43	.79	1.27	.71

abandon the book business and concentrate on candy, tobacco and magazines if it wishes to maximize the contribution as a percentage return on inventory investment. But of course this recommendation is ridiculous. The contribution-return on inventory investment shown in Table I, although it is better than the other criteria, cannot be used as the basis for policy recommendations without further refinement. In order to consider intelligently the policy implications of the capital budgeting approach to merchandise management, we must first examine in more detail the logic underlying the use of the contribution-return on inventory investment as a criterion of performance.

To simplify the problem we will assume for the moment that the demand for any one item in the store

TABLE II

RANKING OF DEPARTMENTS IN ILLUSTRATIVE STORE, BY VARIOUS PERFORMANCE CRITERIA

Performance Criterion	Books	Loose Leaf	Social Stationery	Sporting Goods	Fountain Pens	Candy, Tobacco and Magazines
Sales per square foot	2	5	6	3	4	1
Gross profit percentage	6	1	2	4	3	5
Net profit percentage	6	3	5	1	2	4
Dollars of gross profit per square foot	2	3	6	5	4	1
Turnover rate	2	4	6	3	4	1
Contribution per sq. ft.	2	5	6	3	4	1
Contribution as percentage of sales	6	1	4	3	2	5
Contribution return on investment	6	2	5	3	4	1

SOURCE: Table I.

is independent of the demand for all other items. This ignores the problem of the leader or traffic-builder department, a problem to which we will return at a later point.

Before any move is taken to shift inventory investment out of the less profitable departments and into the more profitable ones, the retail manager should ask whether he is allocating his investment funds as efficiently as possible within any single department.

Here a variation of merchandise management accounting can be brought into play. If the merchandise management accounting method suggested either by Jones or by McNair and May is altered slightly to show for individual types of goods the contribution in the form of the equivalent annual return on inventory investment, merchandise management accounting can be used to make optimum use of funds within any single department.

This point calls for some amplification. In his original discussion of merchandise management accounting, Jones noted that the objective of merchandise management accounting is to estimate the prospective profit contribution of any item of merchandise.

He then stated, "From an economic standpoint, this requires the ultimate expression of such information in terms of rate of return on inventory

investment as the true criteria of profitability."[6] Yet his suggested procedure detours away from that ultimate objective, for he expresses the dollars of controllable profit as a percentage of sales. It is apparently this controllable profit by itself or as a percentage of sales which he would suggest the department buyer use as a guide in selecting merchandise. It would be much more appropriate for the controllable profit to be expressed as an annual percentage return on the investment.

Purchase Return Over Outlay

McNair and May in their discussion of merchandise management accounting suggest that the contribution to overhead and profit be expressed as a "return on purchase outlay," i.e., as a percentage of the net invoice price of the shipment of goods being evaluated. But this measure fails to give adequate weight to the rate of turnover.

Two shipments of goods may each show a purchase return over outlay of 25 per cent by the method suggested by McNair and May although one may have a rate of stock turn twice as great as the other. The percentage return on purchase outlay in this instance makes the two items appear equally attractive investments, although in fact one is clearly preferable to the other.

To convert this return on purchase outlay to an annual rate of return equivalent, three steps are necessary. First, the average investment in the goods and the accounts receivable arising from the sale of the goods should be substituted for the purchase outlay. As soon as the goods begin to sell, and the accounts receivable collected, the retailer is recouping his investment; therefore as a first approximation, one can assume that the items in the shipment are drawn down at a constant rate over time so that the average investment in the goods is roughly one-half the funds invested in these goods at the time the first unit is sold.

Secondly, the purchase outlay does not represent the retailer's total investment in the item. The firm has paid out not only the purchase price but also the direct costs of selling the item, or at least the direct costs of processing the item and putting it into selling position. So the initial investment is the purchase outlay plus those direct selling costs incurred prior to the actual sale. To say that the initial investment is only the purchase outlay can be compared with the argument that the manufacturer's investment in finished goods consists only of the raw material costs, exclusive of direct processing costs.

Stock Turn

The third step is equally simple. The contribution percentage must be expressed in terms of an annual return on investment. Thus, the dollars of contribution, divided by the average investment, in the given item, should be multiplied by the estimated number of stock turns per year for the item in question to yield a contribution-return on average inventory investment. This permits sensible comparisons of items with different turnover rates. For more accurate estimates, the length of an average stock turn for an item should be computed from the date cash is actually paid out for the merchandise to the date when cash is collected for it.

How might this procedure be applied in practice? Jones has noted that

it is possible to separate the direct costs into two categories. One of these categories consists of those direct costs which vary with the number of physical units handled; the other category consists of those direct costs which vary with the dollar value of sales. Jones indicates that there are relatively few of these cost patterns, i.e., relatively few combinations of the two types of direct costs, in a given store. For each pattern he suggests that a chart be constructed showing the controllable profit (as a percentage of net sales) resulting from any given selling price, assuming different percentage markups.

The Jones approach, though certainly attractive in that it focuses on controllable profit, still falls short of providing the information he says we really want, namely information on the contribution as a rate of return on inventory investment.

This drawback can be overcome rather simply. On any single item being considered for purchase by a department buyer, the contribution-return on inventory investment equals the contribution (in dollars) divided by the average investment (computed as one-half of the purchase price plus one-half of the cost of getting the merchandise into selling position) the whole expression being multiplied by the expected turnover rate and then by 100 to give a percentage figure.

Let

C = contribution percentage return on inventory investment

C' = contribution per unit in dollars

T = turnover rate[7]

S = selling price per unit

W = net purchase price per unit

I = average inventory investment

D_1 = direct cost, in dollars, per unit handled

D_2 = direct costs which vary with dollar sales, expressed as a percentage of selling price

Then

$$C = \frac{C'}{I} \cdot T \cdot 100^{8}$$

but since

$$C' = S - (W + D_1 + D_2S)$$

and

$$I = 1/2(W + D_1 + D_2S)$$

then

$$C = \frac{100T[S-(W+D_1+D_2S)]}{1/2(W + D_1 + D_2S)}$$

which reduces to:

$$C = 200T\left(\frac{S}{W+D_1+D_2S} - 1\right)$$

For any given cost pattern, the above expression can be put into tabular form for various probable values of T, W and S.

Table III is a very limited version of such a table, with the costs pattern being one in which D_1 equals \$4.00 and D_2 equals 10 per cent. The invoiced cost is \$10.00 in this example. Similar tables, including more values of T and S, could be easily computed for other costs. The department buyer could enter the table at the selling price of the item under consideration and then read off directly the contribution return on investment permitted by the expected turnover rate. Of course, the higher prices would presumably be associated with lower

turnover rates. By means of this table the contribution-return on investment approach can be used as a basis for pricing policy.

Table III is only illustrative of the end-product of the capital budgeting approach and should not be taken as the only means of presenting the return on investment for the buyer's prospective purchases. If the firm's policy is to use strict price lines in a given department, the return on investment table might show only these price lines as values for X.

Not every conceivable combination of price and turnover rate a buyer might face needs to be included in such a table, of course, since crude interpolation is simple. And, of course, such a table designed for actual use would not carry values for S or T which give negative values for C. Such values are left in Table III so that the full pattern of C-values can be seen.

TABLE III

CONTRIBUTION TO OVERHEAD AND PROFIT EXPRESSED AS AN ANNUAL RATE OF RETURN ON INVENTORY INVESTMENT, FOR SELECTED TURNOVER RATES AND SELLING PRICES, ASSUMING $D_1 = \$4$, $D_2 = .10$, AND $W = 10$

T	S							
	\$13.00	\$14.00	\$15.00	\$16.00	\$17.00	\$18.00	\$19.00	\$20.00
6	−180.36	−109.08	−38.76	30.72	99.36	167.04	234.00	300.00
8	−240.48	−145.44	−51.68	40.96	132.48	222.72	312.00	400.00
10	−300.60	−181.80	−64.60	51.20	165.60	278.40	390.00	500.00
12	−360.72	−218.16	−77.52	61.44	198.72	334.08	468.00	600.00
14	−420.84	−254.52	−90.44	71.68	231.84	389.76	546.00	700.00

It is critical to emphasize that a table such as that illustrated is only a guide to judgment, for the buyer applying the table must estimate what turnover is likely to result from each possible retail price. If he wishes to price the item in question to earn, say, a 165 percent contribution-return, Table III shows that to earn such a contribution-return at a price of \$17.00 requires a turnover rate of 10, whereas an \$18.00 price requires a turnover rate of only 6.

Let us presume that the retailer does utilize this modified version of merchandise management accounting to estimate the contribution-return on inventory investment for the individual items stock within each department. Furthermore, we will temporarily retain the assumption that the demand for each item is independent of the demand for all other items. From among the items that might be bought for each department, the rational retailer would attempt to select those which he estimates would bring the greatest contribution-return on investment.

If we conceive of a single department which is being expanded in terms of inventory investment and space and facilities devoted to it, there must be some size beyond which increments of investment are associated with smaller and smaller contribution percentage returns on investment.[7] In other words, the incremental or marginal contribution percentage return on investment surely must begin to fall at some level of investment.[8]

Marginal Contribution-Return

Within this framework of assumptions, it is clear that if profits are to be maximized, investment funds should be allocated among departments so as to equate the *marginal* contribution-return on investment.[9] In other words, the departments are in balance if the next $100 invested in Department A would result in the same additional contribution as would an additional $100 invested in Department B or an additional $100 invested in Department C, and so on. If the marginal contribution-return in Department A is greater than that in Department B, profits would be increased if funds were shifted out of Department B and into Department A. Since the lines bringing the lowest contribution-return would be dropped from B, the marginal rate in that department would thereby be increased.

In Department A, the addition of inventory would decrease the contribution at the margin. This sort of reallocation of funds would result in increased profits; but when the returns are equated at the margin, further shifts would only decrease profits. Needless to say, this hair-line adjustment can never be made with complete accuracy because of space limitations, inadequate data, shifting demand, and so forth. But the capital budgeting approach calls for the firm always to attempt to move toward this profit-maximizing position.

If the marginal contribution-return on investment is the same in each department, the average contribution-return can, of course, differ greatly from one department to another. In Table I, for example, the contribution-return on investment in the candy, tobacco and magazines department is 127 per cent compared with 71 per cent in the fountain pens department.

At first glance one might conclude that investment funds should be shifted out of fountain pens and into candy, tobacco and magazines. Such a move would increase the marginal contribution-return on fountain pens and reduce it in the candy department. But here the familiar distinction between the average and the marginal or incremental figure is critical. It is conceivable that the next most profitable use of inventory investment funds in the fountain pens department would be the addition of an item which would bring a contribution-return on investment of 60 per cent whereas the next most profitable item which might be added to the candy department would be some obscure candy bar which would yield only 30 per cent.

If this were the case, the contribution-return on investment would be greater at the margin in the fountain pen department than in the candy department even though the *average* contribution is larger in the latter department. Under these circumstances, inventory investment funds could be profitably shifted out of the candy department and into the fountain pens department, thus actually increasing the disparity between the two *average* contributions.

"OK in Theory, But..."

To summarize to this point, it has been argued that, assuming (1) that funds available for investment in inventory are given, (2) that the demand functions for the items in each department are independent of each other and of the demand functions for items in other departments, and (3) that in each department investment in inven-

tory is at or beyond the point of diminishing marginal returns, then profits are maximized in the retail firm if the contribution-return on investment is equated at the margin among items and among departments.

But there is the ancient complaint, "That's OK in theory, but in practice . . ." In the paragraphs which follow certain aspects of the application of the suggested procedure will be taken up.

Loss Leaders

First, is it realistic to assume that the investment in inventory is fixed? Since this is assumed only for the short run, it is probably not unrealistic. If it does appear in the short run that the contribution-return on inventory investment is greater than the cost of capital, an expansion of the investment in inventory is called for. But once the funds are in hand or budgeted in total, the allocation among department and items can be carried out as though that total were fixed. This is surely not a serious departure from reality.

The second assumption is probably justified also. It is undoubtedly true that as the investment in a given department increases from zero, up to some point the contribution-return may increase. This is saying only that a retailer is motivated to establish a department of some minimum size or else not establish it at all. We assume here that the retailer senses with reasonable accuracy what this critical investment level is for each department and that he operates any given department only if his investment in that department is going to be beyond this minimum size.

The third assumption of course cannot be dismissed so easily. The existence of the interdependence of demand among departments, which gives rise to sales in Department A to the customer who came into the store primarily to buy something in Department B, is widely recognized. How can the capital budgeting approach be adjusted to take this feature of retailing into account?

One approach, often found in practice, is to insist that each department "stand on its own two feet," since it is so difficult to determine to what extent demand for the item in Department B really influences the sales in Department A. This presumes, in effect, that all departments benefit to the same degree from the joint demand conditions. More precisely, it presumes that sacrificing a given contribution per dollar of investment in Department B has the same effect on sales in all other departments as does a sacrifice of the same contribution per dollar of investment in any other department.

A second approach, which might be of some use in this context, views the leader department as a type of advertising. The total dollar contribution sacrificed because a given department exists rather than the best alternative use of that space is the cost of generating greater sales in other departments than would otherwise be the case. If the amount of contribution sacrificed can be estimated, then this means of advertising can be evaluated as would other types of advertising.

Tests for Demand

To learn which of these approaches is justified, a number of tests of cross-elasticity of demand might be attempted. First, the historical scales might possibly indicate whether the department sales, e.g., the annual "white sale," have any effect on the sales of other departments. A crude

estimate of the dollar of contribution generated in other departments per dollar of contribution lost in the "sale" department would give some notion as to the promotional effect of the margins lost. Or charge accounts could be checked during the period of such sales to ascertain what else was bought on the day of the sale by people whose accounts show purchases in the sale department.

As a first approximation, it could be assumed that an account showing, say, $20 of purchases in other departments on the day a $4 purchase was made in the sale department, indicates $20 of sales which would not have been made had it not been for the sale. The illustrative customer in this case might have brought some if not all of the $20 worth of purchases even if there had been no sale. And some sales in other departments may have been directly traceable to customers who came into the store to look at the sale items even though they did not buy them. Whether the bias of the first sort is greater than or less than the bias of the second sort is difficult to say.

If the sale is one such that a high proportion of people who came to look at the sale item buy something on sale, then the bias of the first sort is likely to be greater than the bias of the second type. It is apparent that these interrelationships are of the most complex sort. But they are interrelationships which must be considered by the retailer regardless of his use of the contribution-return on investment as an index of performance. They are not complexities which arise because of the use of the contribution index. Rather the use of the contribution-return on investment merely exposes to brighter light a problem which has actually been there all the time.

Suppose that application of the direct costing technique to individual lines of merchandise in the illustrative book store were to reveal, as it well might, that the marginal contribution-return on investment in books is far below the marginal contribution-return on investment in the candy and other departments. What should be done about it? In this particular case, undoubtedly the management would reason that since it is a student-owned book store it should carry sufficient books to meet some stipulated and presumably high proportion of student book needs even though this may not be definitely consistent with short-run profit maximization for the store.

What About Customer Service?

This service criterion, then, rather than the marginal contribution-return on investment criterion, should set the size of the book department investment. The remaining departments, however, could be balanced by means of the contribution-return on inventory investment criterion. This policy would be based on the assumption that these other departments support each other and that no single department is a greater traffic builder than is any other.

If it is felt strongly that the existence of the candy, tobacco and magazines department causes greater sales in the other departments, then investment in this department might be pushed beyond the point at which its marginal contribution rate would be equated with that of the other departments.

This leaves one main question unanswered: Should not the dollars of contribution per square foot play some role in the decision to increase or to decrease investment in a department? The answer is in the negative if the re-

tailer has a justifiable and rigid rule setting the inventory density per square foot in each department. But presumably this is generally not the case, and this introduces a complication into the capital budgeting solution to the merchandise management problem.

Space Budgeting

The emphasis on the dollars of contribution per square foot of floor space no doubt arises because some retailers recognize that it is floor space, and not capital, which is the really limiting factor in their operations. The problem of merchandise management is, then, a two-fold one; space budgeting as well as capital budgeting is involved. If a retailer does not wish to consider changing the space allocated to various departments in the given planning period, then the space budgeting problems are set aside and the capital budgeting approach can be employed.

But suppose the retailer is willing to consider changes in the amount of space alloted to various departments. Ignoring for the moment the restrictions on changes in sizes of departments, how might the problem be viewed? Assume that Department A is estimated to be earning $100 contribution on the marginal square foot while Department B is earning only $50. If it were practical to shift one square foot out of Department B (thus reducing B's total contribution by $50) and into Department A (thus increasing A's total contribution by $100), the whole operation would be generating an additional $50 contribution just because of this shift in space. But presumably this contribution from the marginal square foot of space falls off in any department as it is increased in size, while the contribution of the marginal square foot increases in any department is reduced in size. The shifting of floor space, ideally, between Departments A and B in the above example, would continue until Department A is so large relative to B that the dollars of contribution from the marginal square foot in the two departments are roughly equal.

Let us assume for the sake of argument that these are equated at $70 per square foot in each of the two departments in question. Assume further that Department A shows an average inventory investment per square foot of $140 while Department B's average inventory investment is only $70. A's marginal contribution percentage return on investment is only 50% compared with B's 100%. This would suggest that if the nature of the merchandise and store policy permit the density of merchandise, i.e., the inventory investment per square foot, should be increased in Department B and decreased in Department A. If this is done, the dollars of contribution of the marginal square foot would be reduced in Department A and increased in Department B, thus warranting a shift of some space from A to B.

It appears that under apparently reasonable assumptions about the shape of the contribution function, both space and capital can be allocated among departments in such a manner as to yield a single optimum solution, at which point the marginal contribution percentage returns are equated for all departments and the dollars of contribution of the marginal space are also equated for all departments.[10]

In actual cases, of course, one finds that retailers are faced with certain restrictions on the allocation of space

among departments. Furthermore, they may have certain well-founded policies which restrict the possibilities for varying the inventory investment per square foot in a given department. One would scarcely expect to find the application of the logic of this paper to an actual case to result in equality of the estimated marginal returns.

However the reasoning suggested here, if applied to a firm's present operations, might well reveal certain departments which are clearly far short of or far beyond optimum size. The objective of the capital budgeting approach to merchandise management is not to identify for any given retailer an exact, pin-point optimum solution to the problem of balance among departments, but rather to provide a guide for avoiding really bad decisions and for moving toward the optimum.

Conclusions

The usual measures of performance of individual lines of merchandise and of departments, such as percentage gross margin, sales per square foot and rate of stock turn, are all inherently inadequate when used alone. The contribution return on inventory investment, however, is a much more inclusive and therefore useful measure. Assuming 1) fixed inventory investment, 2) independence of demand among departments and among lines within departments, and 3) that investment in any one department or line of merchandise is pushed at least to the point of diminishing marginal returns, then profits are maximized if the contribution return, expressed as a percentage of investment, is equated at the margin. The first and third assumptions are not unrealistic, at least for the short run. The second one causes difficulties which cannot easily be surmounted. These difficulties, however, do not arise because of the use of the contribution return on investment as a criterion of performance, but rather have been a headache for retail managers all through the years.

It appears that the problem of capital budgeting can be solved simultaneously with the problem of space budgeting, although precise solutions involving equality at the margin will presumably never result because of restrictions arising from the nature of the store layout and of the firm's merchandising policies. Nevertheless the capital budgeting point of view would appear to be a worthwhile point of departure for consideration of the nagging problem of balance among departments.

MATHEMATICAL APPENDIX

Saul H. Hymans

In the body of this article Professor Holton has referred to "the nagging problem of balance among departments" in a retailing operation which consists of more than one sales department. To aid in solving the problem, Holton considers an index called the "Contribution-return on Inventory Investment." This index in its simplest form measures the department's (or merchandise line's) contribution to overhead and profit as a percent of the average inventory investment in that department (or line). This index can be made to include more relevant information than the usual measures and can be made to focus attention on the marginal or incremental returns. This provides a more reasonable criterion for maximizing the profits of the entire retail operation subject to practical limitations such as interdependencies of demand, the existence of so-called "traffic-building" departments, and so on.

This appendix considers the problem of budgeting both capital and space among departments, and investigates whether a short-run optimizing solution exists under rather general assumptions. Optimization will be equivalent to maximizing the total contribution to overhead and profit of the operation as a whole. This criterion is analogous to Holton's for the capital budgeting problem.

The General Case

We assume a retail store with n departments, such that the profit (or contribution to overhead and profit) of the entire store is a continuous, differentiable function of the amounts of floor space allocated to each department, and of the size of the inventory investment in each department.[11] X_i will stand for the floor space allocated to the i-th department. The space constraint arises from the fact that the size of the building is fixed in the short run. $\overline{X}$ will denote the total available floor space. I_i stands for the inventory investment in the i-th department, and the capital constraint is $\overline{I}$ which is the value of the maximum inventory which can be held during the given period. The problem may thus be restated as follows, where f is the contribution function:[12]

To maximize $f(X_1, X_2, \cdots, X_n, I_1, I_2, \cdots, I_n)$ subject to:

$$\sum_{i=1}^{n} X_i = \overline{X}\,, \qquad \text{space constraint}$$

and

$$\sum_{i=1}^{n} I_i = \overline{I}\,, \qquad \text{capital constraint.}$$

We then form the function

$$\pi = f(X_1, X_2, \cdots, X_n, I_1, I_2, \cdots, I_n) - \lambda_1(\textstyle\sum X_i - \overline{X}) - \lambda_2(\sum I_i - \overline{I})$$

where λ_1 and λ_2 are Lagrange Multipliers.

To maximize the function π we set the partial derivatives with respect to X_i, I_i, λ_1 and λ_2 equal to zero:

$$(1) \qquad \frac{\partial \pi}{\partial X_i} = f_{X_i} - \lambda_1 = 0 \qquad i = 1, 2, \cdots, n$$

$$(2) \qquad \frac{\partial \pi}{\partial I_i} = f_{I_i} - \lambda_2 = 0 \qquad i = 1, 2, \cdots, n$$

$$(3) \qquad \frac{\partial \pi}{\partial \lambda_1} = -\sum X_i + \overline{X} = 0$$

$$(4) \qquad \frac{\partial \pi}{\partial \lambda_2} = -\sum I_i + \overline{I} = 0$$

(3) and (4) satisfy the space and budget constraints. Then,

$$(1.1) \qquad f_{X_i} = \lambda_1 \qquad i = 1, 2, \cdots, n$$

$$(2.1) \qquad f_{I_i} = \lambda_2 \qquad i = 1, 2, \cdots, n$$

This condition states that the optimum occurs when all departments are at the point of equal marginal contribution (to overhead and profits) per unit of floor space, and *simultaneously* all departments are at the point of equal marginal contribution per unit of inventory investment. Any relationship which exists between returns to size and returns to investment can be determined only if the profit (or contribution) function is given a more specific form.

The first-order conditions[13] can be further modified thus

$$(1.2) \qquad f_{X_i} = f_{X_1} \qquad i = 2, 3, \cdots, n$$

$$(2.2) \qquad f_{I_i} = f_{I_1} \qquad i = 2, 3, \cdots, n$$

This gives us a system of $(n - 1) + (n - 1) = 2n - 2$ equations in $2n$ unknowns. The constraints (3) and (4) above, however, permit the solution of $2n - 2$ unknowns in terms of, say, f_{X_1} and f_{I_1} and then the latter are automatically determined.

A More Specific Case

Neglecting the problem of interdependence of demand between departments,[14] and limiting the problem to a 2-department store, let us assume rather specific contribution functions for each of the two departments A and B.

One might assume quite reasonably that there is an initial range of sizes in terms of space and inventory investment which is below departmental optimum in the sense that $\partial \pi_A / \partial X_A > 0$ and $\partial \pi_A / \partial I_A > 0$. This is to say that the contribution of the given department initially increases as size and investment in that department increase. Beyond the departmental optimum $\partial \pi_A / \partial X_A < 0$ and $\partial \pi_A / \partial I_A < 0$. Further $\partial^2 \pi_A / \partial X_A{}^2$ and $\partial^2 \pi_A / \partial I_A{}^2$ must be non-positive at least beyond the departmental optimum. These conditions are met by a function of the following form.[13]

$$\pi_A = a + bX_A + cI_A - eX_A I_A .$$

This function indicates that contribution increases with X_A and I_A, but decreases as the product $X_A I_A$ increases, hence:

$$\frac{\partial \pi_A}{\partial X_A} = b - eI_A = \begin{cases} > 0 & \text{for} \quad b > eI_A \\ < 0 & \text{for} \quad b < eI_A \end{cases}$$

$$\frac{\partial^2 \pi_A}{\partial X_A{}^2} = 0$$

$$\frac{\partial \pi_A}{\partial I_A} = c - eX_A = \begin{cases} > 0 & \text{for} \quad c > eX_A \\ < 0 & \text{for} \quad c < eX_A \end{cases}$$

and

$$\frac{\partial^2 \pi_A}{\partial {I_A}^2} = 0$$

The constant term in the function would be negative to indicate an overhead loss if the department were not operating; all other parameters are assumed positive.

Assuming $\pi_B = a' + b'X_B + c'I_B - e'X_BI_B$ and space and budget constraints given by $X_A + X_B = \overline{X}$, and $I_A + I_B = \overline{I}$ respectively, one forms the total contribution function just as in the General Case.

$$\pi = (a + a') + bX_A + cI_A - eX_AI_A + b'X_B + c'I_B - e'X_BI_B - \lambda_1(X_A + X_B - \overline{X}) - \lambda_2(I_A + I_B - \overline{I}) .$$

Differentiating:

(1.3)
$$\frac{\partial \pi}{\partial X_A} = b - eI_A - \lambda_1 = 0$$
$$\frac{\partial \pi}{\partial X_B} = b' - e'I_B - \lambda_1 = 0$$

(2.3)
$$\frac{\partial \pi}{\partial I_A} = c - eX_A - \lambda_2 = 0$$
$$\frac{\partial \pi}{\partial I_B} = c' - e'X_B - \lambda_2 = 0$$

from (1.3) and (2.3):

(1.4) $\quad b - eI_A = b' - e'I_B$

(2.4) $\quad c - eX_A = c' - e'X_B$, since $I_B = \overline{I} - I_A$ and $X_B = \overline{X} - X_A$ (by definition)

(1.5) $\quad I_A = \dfrac{b - b' + e'\overline{I}}{e' + e}$

(2.5) $\quad X_A = \dfrac{c - c' + e'\overline{X}}{e' + e}$

Further, it is necessary that $b' \leqq b + e'\overline{I}$ and $c' \leqq c + e'\overline{X}$ in order that I_A and X_A be non-negative. I_B and X_B are given by subtraction with similar non-negativity conditions, or by symmetry:

$$I_B = \frac{b' - b + e\overline{I}}{e' + e} \quad \text{and} \quad X_B = \frac{c' - c + e\overline{X}}{e' + e}$$

If desired, optimal inventory investment per square foot is readily available for, say, department A as $I_A/X_A = (b - b' + e'\bar{I})/(c - c' + e'\bar{X})$ and so on.

Let us now investigate the relationship which exists between a store optimum and a departmental optimum. Consider first the inventory investment in department A. The optimizing value of I_A is given by (1.5):

$$I_A = \frac{b - b' + e'\bar{I}}{e' + e}$$

with $b' \leqq b + e'\bar{I}$ or equivalently $b \geqq b' - e'\bar{I}$. Recall that the optimum for department A alone is in part determined by the relationship between eI_A and b; i.e.,

$$b \stackrel{?}{=} eI_A \qquad \text{or} \qquad \frac{b}{e} \stackrel{?}{=} I_A$$

Making use of (1.5) and the non-negativity condition:

$$\frac{b}{e} \geqq \frac{b' - e'\bar{I}}{e} \stackrel{?}{=} I_A = \frac{b - b' + e'\bar{I}}{e' + e}$$

or more simply, consider:

$$\frac{b' - e'\bar{I}}{e} \stackrel{?}{=} \frac{b - b' + e'\bar{I}}{e' + e}$$

With e and e' positive, the denominator on the right is greater than that on the left. Now taking the numerators:

$$b' - e'\bar{I} \stackrel{?}{=} b - b' + e'\bar{I}$$

$$2(b' - e'\bar{I}) \stackrel{?}{=} b$$

$$(b' - e'\bar{I}) \stackrel{?}{=} b/2$$

but,

$$b \geqq b' - e'\bar{I}$$

Case 1. If department A requires a large enough inventory investment at the store optimum, then not only b, but even $b/2$ will be larger than $(b' - e'\bar{I})$.

In this event, $b - b' + e'\bar{I} > b' - e'\bar{I}$ and therefore $I_A \gtrless (b' - e'\bar{I})/e$ depending on the parameters b' and e'.

$$\therefore eI_A \gtrless b' - e'\bar{I} \leqq b$$

and one cannot determine in general whether department A is operating above or below its own space optimum.

Case 2. If department A requires only a small inventory investment at the store optimum, then $b/2$ will be less than $(b' - e'\bar{I})$. In that case,

$$I_A < \frac{b' - e'\bar{I}}{e}$$

$$eI_A < b' - e'\bar{I} \leqq b$$

$$\therefore eI_A < b\,.$$

This indicates that department A is operating below its space optimum. If department A proceeded to move toward its own optimum, however, the total contribution of departments A and B would decline. Thus A must remain below its own space optimum in order to maximize the contribution of the entire retail operation.

Completely analogous considerations can be applied to the investment optimum and, of course, to department B.

The contribution functions which we have assumed in this specific case lead to the following general conclusion: There is no guarantee that maximization of the contribution to overhead and profit of the entire retail operation will require maximization for each department within the store.[16]

REFERENCES

(I am indebted to my colleagues at Berkeley, H. E. Allison, L. E. Preston, R. Sprouse, W. G. Vatter, and L. L. Vance, and to S. C. Hollander and M. P. McNair for comments which led to substantial improvements in this paper.—R.H.H.)

1. For a more detailed discussion of the predecessors of merchandise management accounting, see Malcolm P. McNair and Eleanor G. May, "Pricing for Profit," *Harvard Business Review*, Vol. 35 (May–June 1957), pp. 105–122.

2. See note 1.

3. See note 1.

4. To be conceptually accurate, *I* in the equation above should be computed on the basis not only of the purchase price of the goods but also the cost of getting the goods into selling position. Professor McNair has suggested (in correspondence) that one should, in order to be completely accurate, compute the average investment to include the investment in the accounts receivable generated by the merchandise in question. Because we are interested in the return on the investment of cash in the merchandise, we should compute the turnover by dividing into 360 the estimated number of days between the outlay of cash and the collection of cash from the sale. This turnover figure would, therefore, reflect not only the length of time cash may be tied up in accounts receivable but also the credit terms on which the purchase was made. (I am indebted to Prof. S. C. Hollander for calling my attention to the problem of the credit terms.) Use of this adjusted turnover figure rather than the more common turnover measure may yield quite different results, particularly for goods with high turnover (as usually defined) rates.

5. Robert I. Jones, one of the initiators of merchandise management accounting, has emphasized the importance of the return on inventory investment in retailing, but he has not explicitly noted that maximizing the contribution return on inventory investment maximizes profits assuming a given investment in inventory. See his *Merchandise Management Accounting—A Further Discussion*, an address before the NRGDA Controllers' Congress Convention, May, 1957.

6. See note 5.

7. Strictly speaking, the turnover should refer to the turnover of the funds invested in the inventory in question. Thus a highly refined approach to this solution would call for an estimate of average investment which would be corrected for deferred billing and for the fact that accounts receivable are not immediately converted to cash.

8. Here $\frac{C'}{I}$ is the dollars of contribution per dollar of investment; multiplying by T converts the return to an *annual* rate; and multiplying by 100 converts the expression to a *percentage* annual rate.

9. It is possible that the investment in a department could be so small that customers would overlook the department entirely; under these circumstances increments in investment might be associated with increases in the contribution percentage return on investment over a certain range. See F. E. Balderston, "Assortment Choice in Wholesale and Retail Marketing," *Journal of Marketing*, 21 (October, 1956) 182.

10. I am indebted to Saul H. Hymans of the University of California, Berkeley, for working out the formal solution to this problem. His work appears in the Mathematical Appendix.

References for the Mathematical Appendix

11. No attempt is made here to introduce inventory investment in any dynamic sense.

12. This statement of the problem bears a striking resemblance to a linear programming problem. Indeed, the linear programming approach may ultimately be the most useful for practical applications. This would easily permit inequality constraints which are certainly more reasonable than the equalities stated above.

13. The second-order conditions can be explored by the use of the second directional derivative of the function. This would require that a quadratic form depending on the parameters of the function be negative in all directions away from the critical point determined by the first order conditions. It does not seem necessary to pursue this point in this general discussion because the nature of the critical point will usually be obvious for more specific contribution functions.

14. The contribution function used in the general case made no assumption of independent demand functions. In fact the marginal contribution with respect to, say, X_1 might well depend on $(X_2, X_3, \ldots, I_1, I_2, \ldots)$ and so on.

15. The conditions are also met by many other functions. This particular form is adopted only because it does not seem to be particularly unreasonable and serves quite well to illustrate more concretely the implications of the general solution.

16. Professor Holton demonstrates this in the body of the article on a less abstract level, and makes use of it in his analysis of departmental balance in terms of both space and capital budgeting.

As society grows more complex, the big corporation thrives and amasses political as well as economic powers which rival those of the state. Who exercises these vast powers? To date, it has been the managerial élite. Tomorrow, as union pension funds and bank-administered trusts buy controlling blocks of stock in the big, blue chip firms, our corporate giants may have new masters.

THE POLITICS OF A CHANGING CORPORATE SOCIETY

DOW VOTAW

Dow Votaw, an authority on antitrust law and legal history, is Associate Dean and Professor of Business Administration at the University of California, Berkeley. He is the author of the book Legal Aspects of Business Administration *and currently engaged in a study of the legal and political nature of the modern corporation, some aspects of which he covers here.*

POLITICS is a broad, and perhaps even classical, term for the customs, usages and traditions, for the policies, relationships and arrangements through which men and societies live and are governed and by which men work at shaping their destinies. Partisan politics are a part of this broader term, but not the part with which this paper is primarily concerned.

A hundred years ago, the term "political economy" could have been used to describe the aspects of "politics" which constitute the focus of this article, but that term, unfortunately, has had to be abandoned. Once the economists, the political scientists and the sociologists went their separate ways, "political economy" was left with nothing it could call its own.

This fragmentation has had some unhappy consequences, especially in making it difficult to get an over-all view of our society or of any of its major parts. Some fraternization takes place, of course—in recent years, an increasing amount, but fraternizing is not yet the natural thing to do.

Our knowledge and understanding of the corporate segment of the society have been profoundly influenced by

the lack of any interdisciplinary studies of the corporation. We know the corporation reasonably well as an economic institution, and the sociologists are beginning to take an interest in it as a social institution. The political scientists, oddly enough, have largely ignored it.

The result is a rather lopsided and misleading picture of corporate society. The large corporation is certainly one of the dominant features, if not the dominant feature, of our society and, as such, cannot be properly appraised or understood in economic terms alone. Only if we have a thorough familiarity with the corporation as a political institution, as well as an economic and social one, can we hope even to recognize the effects that it has had and will have on the rest of society.

The purposes of this paper are to consider the characteristics which the large corporation has in common with other political institutions and to offer some suggestions as to the kinds of issues which are raised when the corporation is examined in a political frame of reference. Before this can be done profitably, however, it will be necessary to review briefly the historical development of our corporate society.

Evolution of the Corporate Society

In the year 1553, a group of London merchants financed an exploratory voyage by Sebastian Cabot, the son of John Cabot, for the purpose of opening up trade relations with the Russians through the port of Archangel. When one of the three original vessels returned safely to England with a report that the Russians were receptive, the London merchants obtained from Bloody Mary a royal charter as a corporation "as one bodie and perpetuall fellowship and commaltie" known as the "Russia Company" or, more extensively, as the "Merchant Adventurers of England for the Discovery of Lands, Territories, Isles, Dominions and Seignories, unknown and not before that late adventure or enterprise by sea or navigation commonly frequented."

This was the first English company intended to operate on a joint stock. The charter did not even mention it, but the agreement for the expedition in 1553 had mentioned it, and "joint stock" is the way the company actually operated.

Adam Smith Did Not Approve

The next two and one-half centuries witnessed the greatly increased use of the joint stock and the gradual evolution of the legal forms facilitating its employment. Permanent capital, limited liability and legal personality became characteristics of the corporation, but the corporate device played a minimal role in society. Most corporations, both in America or abroad, were public or quasi-public in nature and often, especially in England, were actually arms of the state concerned with foreign exploration or exploitation.

Adam Smith did not approve of corporations and did not believe that they had any future. "The pretence that corporations are necessary for the better government of the trade, is without foundation," he wrote in *The Wealth of Nations*. Even the enactment of the first general incorporation law in Massachusetts in 1809, organization theretofore having been by royal charter or by special act of the legislature, did not for a long time spread the use of the corporate device much beyond the quasi-public areas.

The corporation was ready for its new role, but society and the economy

had not yet provided the necessary climate. While the corporation bided its time, society had an opportunity to get used to it in small doses. Our ancestors became accustomed to corporate personality and immortality and to a small, mostly illusory, separation of the ownership of property from its control.

There was plenty of time to adjust to new ideas, and most of these ideas did not seem very important anyway. The building of the railroads, the rapid expansion of the economy and the country after the Civil War, the appearance of national markets and mass production, and the need for vast amounts of capital changed all of that.

Adam Smith was correct; the corporation was not necessary in 1776. But a century later, in America at least, the corporation was necessary. Within a very short period of time, the need, the desire and the technique all came together, and the large business corporation became one of the major landmarks on the American scene.

Immortal and Untrammeled

The implications of corporate characteristics did not go unnoticed during the early years of the 19th century. Immortality and personality were easily acceptable when possessed by a city or by a university but were something quite different when possessed by a private profit business corporation. Adam Smith was not the only one who saw threats to the liberty and opportunity of the individual businessman or who feared the growth of monopoly.

The draftsmen of the early incorporation laws were afraid of the perpetual and unlimited accumulation of property by the corporation. Perhaps some of these draftsmen remembered their English history and recognized the parallel with Edward I and the statute of Mortmain. Others were concerned about creating non-human persons who, without soul or conscience or morals, could roam the world as they wish, beholden to none and immortal to boot.

Most of the early statutes tried to limit the life of a corporation to 25 or 30 years, to limit the accumulations of capital and property, especially land, and to limit the powers and activities of these organizations. All of these pathetic limitations have been swept away. Corporate life is perpetual; there are no effective statutory limits on accumulations; and the limits on power and activity are remembered now only by legal scholars interested in the quaint old doctrine of ultra vires. Chartermongering and the needs of the economy brought an end to these methods of allaying the fears and suspicions of a century ago.

Interestingly enough, most of the fearful predictions of the 1800's have come to pass, but how different they look today! The highest standard of living in history, the broadest distribution of wealth in the memory of mankind, spectacular achievements in science and in commerce so commonplace we hardly pay any attention to them, and all of these things made possible, to some degree, by a society dominated by large corporations.

Tremendous benefits have softened the consequences that our ancestors predicted for us. Some dangers that our ancestors never dreamed of have also appeared on the scene, and the benefits are not entirely unmitigated, but we have learned new ways of dealing with some of the problems and we have learned that what may have appeared to be an evil result in 1860 may turn out to be a blessing a hundred years later.

For better or for worse, we cannot go backward and we cannot very materially change the course on which we are now embarked. We can seek to discover the implications of what is going on; we can foresee the dangers that are being created and take steps to avoid them. We can and should re-examine the premises on which we base our political decisions and re-appraise the goals toward which we are striving.

Corporate Mythology

Until very recently, we were not doing any of these things. We have been enacting statutes and making decisions with regard to the corporate segment of our society in terms of the fears, the premises and the goals of a hundred years ago. The legislators, the professors and the corporate spokesmen have all been guilty of this intellectual error. We have created a kind of corporate mythology under which we try to explain events we do not understand in terms of things that no longer exist.

Most attacks on the corporation are still based on the 19th century fears. The language used by most critics of the large corporation is straight out of the 19th century: "heartless," "inhuman," "big," "stifles small business," "separates owners and managers," "massive," "monopoly," "without conscience or soul" and many other examples.

Oddly enough, most defenses against these attacks on the corporate system are in the same vernacular and often attempt to take on a rather folksy air. It is difficult in this atmosphere to think clearly about the real problems of our corporate society. The 19th century fears must be forgotten, and the completely individualistic approach to society that condemns every organization beyond the family must be abandoned.

We must accept the large corporation as an important, proper and probably permanent factor in our environment. It is time to re-examine the premises and deal with the situation as it is rather than as it was a hundred years ago.

Corporation as Political Institution

If we want to examine wide ranges of the broader politics of a corporate society, and if we want to look objectively at the position of the corporation in our society and eventually give consideration to some of the implications of what we find, our first step is to recognize the large corporation and the corporate system as political institutions and appraise them as such.

What we must be concerned with is the political nature of the large corporation, individually and collectively. The visitor from a small planet would probably not attach much importance to the small corporation in our society, but he would certainly be impressed by the part played in every phase of American life by the large corporation. The dominant feature in our society, in other words, is not the corporate form itself but the adaptations of that form in the very large scale enterprise.

In rough outline, the incorporated corner grocery and General Motors look very much alike, but in the actual use of the corporate form they are farther apart than are the corner grocery of 1960 and its predecessor of a hundred years ago. The use of the corporate form by the large corporation is no more like the use by the corner grocery than the use of crude oil by Standard of California is like its use by an Indian medicine man. There are vast discrepancies between the legal

structure of large business corporations and their real structure.

If we go back to our original explanation of the word "politics" in its broad sense, it becomes very easy to see the corporation as a political institution. The corporation is certainly one of the most important relationships or arrangements through which we and our society live and through which we seek to shape our destinies.

Every day in a thousand ways, corporate activity, both individual and aggregate, affects our lives. Price decisions, collective bargaining agreements, market and product decisions, personnel policies, plant locations and relocations, mergers and consolidations will touch almost every segment of our society. A price increase or decrease by General Motors or United States Steel often has more influence on our economy than does a state or federal budget or a change in the rediscount rate by the Federal Reserve.

Big and Influential

The influence goes far beyond the strictly economic sector also and may show up in foreign policy, space and rocket research, the internal stability of an African republic, or even American social attitudes and customs.

Every organization, whether it be a church, a social club or a corporation, has an internal political order, and in that sense is a political institution, but the organization becomes of interest to us in our present discussion only if it has wide and profound influence on society as a whole and thus is a political institution externally as well as internally.

A large corporation satisfies this criterion; an industry consisting of a few large corporations satisfies it even more clearly; and an economic system characterized and dominated by large corporations satisfies it most clearly of all. This is not suggesting collusion in any legal sense, but merely pointing out that all large corporations have many inherent characteristics in common and that in the aggregate these characteristics have aggregative effects, some of them so important that in these respects the corporate system is a more important political institution than the government itself.

Fathered New Middle Class

Individual income and college enrollment statistics are all the evidence we need of the vast explosion that is now going on in the American middle class. From a small fraction of the population in 1850, the middle classes have grown to a point where they now represent well over one-half the population. The sheer size of the middle class is not as important as the fact that it is still growing very rapidly, especially the intermediate ranges represented by the junior executives, professionals and those in managerial capacities below the policy level. Perhaps a third of our population already falls into this "middle-middle" category.

It is the large national corporation, more than anything else, that has brought about this middle class explosion. The corporation has brought millions of new white collar employees into its ranks and bestowed upon them middle class status. The managerial and technical specialist groups have expanded tremendously and now make up a far larger portion of the working force than they did even 25 years ago.

Other factors have contributed to these changes, but the corporation, as the characteristic institution of our age, has shaped and guided the changes

and controls their final form. Some effects of the middle class explosion are only too obvious. Even without the work of Riesman, Lynes, White, Parsons, Spectorsky, Mills, Wilson and many others, we would have recognized many of these effects. We still do not know what they will bring in the long run.

Some of the characteristics of the new middle class are worth noting here because they are fast becoming the characteristics of our changing corporate society. The new middle class is not only large, it is national and transient. The man who once called Springfield "home" is now more likely to live in one indistinguishable suburb after another on his climb up the corporate ladder.

The sense of belonging to a local or regional community rarely has time to develop. There is good evidence that corporate citizenship is replacing local citizenship among large segments of this middle class, with deep ramifications for a democracy built on the assumption of local loyalties.

Corporate Citizenship

The need for the feeling of belonging is strong in all of us, and it is easy to see why, with corporate encouragement, the transient middle class adopts corporate citizenship. David Riesman sees the effects of this already in the loss of political commitment in local, state and federal elections, a commitment which was traditional in the older middle class.

The new middle class is propertyless. With this condition may go the destruction of what has been an integral part of political theory over the last several hundred years. Property provides the little area of freedom where one can say what he believes without being afraid of losing his livelihood. The argument for private property is based in large part on this idea. This is why Jefferson wanted every man to be a property owner.

Rootless and Propertyless Workers

The vigor and the power of the middle class of the past was due to the fact it was a property owning class. For the individual, corporate citizenship and status may provide a kind of substitute for property, but for a political system created by property owners for property owners on the assumption of widespread property owning, the change may bring unexpected and perhaps unpleasant consequences.

Not all of these characteristics of the new middle class contain danger signals, but all of them do indicate a need for re-examination of our assumptions and basic premises. Our present situation may be much like having unexpectedly fallen heir to a million dollars. We are not going to return the money just because we have a few qualms about the responsibility involved, but if we do not learn to recognize and accept the responsibility, we will not enjoy the benefits of the inheritance and may lose it altogether.

One of the greatest benefits that the modern corporate system has provided, and is now providing more than ever, is that of filling the vacuum left between the much more slowly evolving art known as "statecraft" and the amazing expansion and improvement of technology.

Filling Political Vacuum

In an age when no point on earth is more than a few hours, or even a few minutes, from any other point, when the whole world is so closely and irrevocably linked together that even the

remotest corners are affected by the acts of Congress, of Standard Oil, or of Lever House, when almost no trade or industry can be confined within existing national boundaries, our past failures and present lack of progress in statecraft are creating new and independent nations along ethnic, cultural, territorial and even tribal lines which have not made sense for a thousand years and which will make nothing but trouble for a thousand more.

Into this incredible vacuum between political frontiers on one hand and the advances of science and commerce on the other has moved the corporation. Our ancestors were worried about corporations roaming the world at will; we are lucky they do.

Corporate Diplomacy

It has been said recently, and I think accurately, that for the last century, the novel, the brilliant, the daring innovations in the field of politics have come largely from business enterprise. Chief among these innovations has been the adaptation of the corporate technique to penetrate political barriers. The personality of the corporation makes it possible for it to be a citizen of one country while its stockholders and managers are citizens of other countries, and, thus, the corporation can provide the vital link which ties the country of its citizenship to the broader world of commerce and technology.

It becomes an instrument of state without the barriers faced by the political state or its citizens. Just as many of the great English trading companies of three centuries ago were instruments of state to penetrate frontiers, to acquire new lands and to govern them, the modern corporation is such an instrument though without all the overtones of nationalism and conquest.

The old trading companies were English with a capital "E," but the modern corporation is international in character, and some will argue fervently that it is international also in fact, an instrument more of a corporate than of a national state. Throughout the world, the corporation is supplying technology, providing markets, opening up frontiers and tying the world together in a fashion which the political states can only observe in awe.

Occasionally, the policies and activities of the corporate instrument of state conflict with the policies of the political state which has jurisdiction over the corporation, or over one or more of its arms, or over one or more of its human beings.

There is no question but what many large corporations make some foreign policy for the United States. (This is a much broader reference than to the local manufacturer who lobbies a tariff into being.) There is no evidence, however, that these corporate foreign policies are any worse than what the government makes, and there is some evidence that most are better. Usually, the conflicts are serious only in time of war or threatened war, when the choice is obvious. A further danger lies, perhaps, in the possibility that the conflict is not visible.

I think enough has now been said toward establishing the corporation as a political institution. Our next step is to examine the ramifications of this conclusion. If the corporation can properly be examined as a political institution, then the important issues become those which are important in other political institutions: power, legitimacy, accountability, influence, and sanctions, to name a few.

There is no need to look at all of these, but to consider the corporation in the framework of a few of them may be useful. If power is to be possessed and exercised over a period of time, it must be legitimate power, and those who exercise it must be in some way accountable to those whose lives it affects. Most of our discussion will be devoted to a consideration of this simple framework.

Concentrated Power

I am not going to try to document the concentration of power in the large corporation. The issues with regard to economic power have been well established, and other types of power have received brief comment above. There are heavy concentrations of power in other portions of our society, too, as the government and the labor unions, for example. But the government is circumscribed by constitutions and is more or less responsible to public demand.

Labor union power, while great, is largely a reflection of the corporate power on the other side of the bargaining table and is a relative newcomer to the power elite. Both are also interesting topics, but neither characterizes our modern society the way the great corporation does.

Accepting then the existence of substantial concentrations of power in the corporate system, our first task is to try to establish precisely the location of that power and of those who wield it. The corporate system in this country has gone through several phases of development in this connection, and the location of the power has shifted several times. It may now be in the process of another important shift. As one might expect, the stockholders held the power in the early years when most corporations were small and when the managers and the stockholders were often the same people. Even if they were not the same people, where one person, or a small group of persons, or members of the same family owned a controlling interest in a corporation, they could look upon the property of the corporation as being very little different from their own property and could select and control the managers as they pleased.

The managers simply represented the expressed will of the stockholders. The original corporate device in this country was based on this idea. There are very few large corporations today, Ford and to a limited extent du Pont, where this stockholder control idea provides an accurate picture. Unfortunately, a lot of our thinking about corporations is still based upon this misleading premise.

Managers Exercise Power

As the size of corporations increased and as their shares were more and more widely held, it became impossible, as a practical matter, for large numbers of uninformed stockholders to exercise any real control or influence over the managers or even, in most cases, to choose them. It was inevitable, under these circumstances that the power should shift to the managers themselves and that the shareholders should become, as a whole, passive.

At annual meeting time, however, the corporation, its managers and shareholders, all participate in a quaint tribal ritual during which shareholders are referred to as "owners," the company as "your company," and the directors as "your directors," but the shareholder must look elsewhere for reassurance during the rest of the year.

The managers like this ceremony too, because they still want to feel that their positions and their power are made legitimate on the ground that they represent the will of the stockholders.

Can it not be argued, however, that the managers do represent the stockholders' will most of the time, simply because the stockholders agree with what the managers are doing and that if the stockholders do not agree, they can throw the rascals out? Several recent, notorious and successful proxy fights would seem to suggest an affirmative answer, although in some cases it was difficult to tell which group contained the rascals.

Actually, however, these proxy fights only support the original statement that power in the large corporations rests with the managers. It cost the Robert Young group, which started with 20% of the stock, $1,500,000 to throw out a New York Central management owning only 2% of the stock of a corporation with relatively few (41,000) shareholders.

Proxy Fights Insignificant

The proxy fights one reads about in the papers involve struggles for the control of small, or at most, medium-sized corporations. Is there likely to be a proxy fight for control of General Motors, American Telephone or Standard of New Jersey? Practically impossible!

There is considerable additional evidence, from the inside and from the outside, that in many large corporations it is not even the directors in whom the corporate power rests but the officers, who select their own boards of directors, often on the basis of reward for faithful service.

Legitimacy would be a greater problem for the management in this sort of situation. Adolf Berle has called the present phase of corporate power an "automatic self-perpetuating oligarchy." But there is no point in getting too excited about the present phase, because the indications are strong that it is on its way out too.

Shift in Power Axis Due

Just as Henry Ford's Model T transportation eventually revamped America's cultural patterns and redistributed the population, a movement originally unrelated to corporate power may now be signalling the end of the manager's phase. I do not suppose that anyone who participated in the early growth of the pension plans during and after the First World War could have guessed that what he was starting would in less than forty years cover more than a quarter of the entire American working population, amass assets of more than $35 billion, and threaten to make basic changes in the whole economic system.

There is nothing new in personal savings or in a government pension, but the pension funds are new in that they are neither personal savings nor state-controlled funds but are vast aggregations of wealth upon which many have claims of greater or lesser enforceability and which nobody owns. Originally, these funds were looked upon as gifts by employers to their workers in recognition of long and faithful service, and most of them could not be enforced in any way.

More recently, as the unions have included pension plans in their war-induced search for fringe benefits, the arrangements have become more formal, but not as formal, especially in terms of management and enforceability of the plans, as one might suppose.

There appears also to be the strong possibility that in the future these funds will be looked upon legally more as compensation than as gifts.

Although many of the early pension plans had no "fund" at all, almost all of the modern plans call for the actual accumulation of funds for the payment of future pensions. A few of the funds are managed by the employers themselves, but most are turned over to banks and other professional trustees under a trust indenture giving the trustee full investment powers.

It is obvious that a pension fund will grow very rapidly during its first years and then tend to level off as the number of claimants reaching retirement age increases and finally stabilizes. Very few of the pension funds in this country are old enough to have reached the leveling-off stage. Most estimates do not see any aggregative leveling until well into the 1970's.

Pension Trusts May Eventually Inherit Corporate Power

The significance of these funds in terms of corporate power is simply that they are heavy buyers and holders of common stock. Thirty per cent of the value of all new issues of common stock in 1958 was purchased by pension trusts. At present, about 30% of the pension funds' investment is in common stocks, but this figure is increasing. In 1958, 43% of the purchases were in equities.

More significant perhaps is the fact that the funds tend to concentrate on certain high quality common stocks, as would be expected of responsible trustees. In the period 1953–55, almost one-third of all pension fund stock purchases was in only 25 stocks, and 90% in a list of 200 stocks.

All of which means that the holdings are concentrated in relatively few corporations. The pension trusts now hold a total of something like $12 billion in common stock and each year buy as much common stock as all individual buyers combined, and have 10–20 years of growth yet to go. There have been predictions that in 25 years the pension trusts may hold 30% or even larger percentages of all the good equities.

There are other factors which must be taken into account also. The pension trustees are almost all banks or insurance companies who also have vast quantities of additional capital to invest. The place of the institutional investor in the securities markets was cause for considerable wonder even before the pension funds became important. It is estimated that in 1955, 31% of the shares on the New York Stock Exchange were held by institutions, with another 30% held by individuals who do not hold long enough to be a factor in corporate control.

"My Management, Right Or Wrong"

The last, and in some ways most interesting, factor is that the institutional holders and pension trustees are themselves heavily concentrated, the heaviest concentration being among a handful of New York banks. All of this raises some interesting questions: Can the trustees or other institutional investors fail or refuse to exercise the power they may eventually possess? Can they continue, for example, a rather common policy at present of voting with management in all cases except where there are serious disagreements, in which case the policy is to sell the stock rather than to vote against the management?

What is happening is that the trend

toward dispersion of share ownership, the trend that brought about the managers' phase of corporate power, appears to be reversing itself, and it is possible that we will see in the next decade or so a shift of corporate power from the managers to the pension trustees and institutional investors, one degree further removed from ownership in any real sense of the word and much more heavily concentrated.

Legitimacy of Power

The second issue of importance to an appraisal of political institutions and their power is that of legitimacy, a highly developed field among students of government and of public institutions but only beginning its development in other political institutions. Legitimacy involves the capacity of a political institution or system to create and maintain the belief that existing political institutions are the most appropriate for the society at a particular time.

Many factors are important here: the way the institution came into existence, how the institution has survived a crisis, how it has handled the key issues that have arisen in the society, how the values of the institution conform to the basic values of the society, and others. Social values change with time, and the legitimacy of a political institution may depend on how the institution adapts itself to changing values of society.

Self-Perpetuating

The corporate institution in the United States has done a good job on most counts of keeping its legitimacy. It had a close call during the 1930's when it appeared to be failing the crisis test and when it appeared not to be adapting to changes in social values. It rode out that storm and performed remarkably well during the crisis of World War II. A weakness now, on this score, may result from the location of power that we have just been discussing, and a crisis might be required before that can really be put to the test.

The symbol and ritual of shareholder control is important here, as similar symbols are important in maintaining the legitimacy of governmental institutions. It is interesting to note that 10 of the 12 stable European and English-speaking democracies are monarchies, thus preserving a thread of legitimacy for political institutions that in some instances approach the far limits of the welfare state. Yet, the loyalty of conservative and aristocratic elements is held by the thread to the past while the institutions are substantially changed. The French Revolution cut this thread so thoroughly that none of the French Republics has had the loyalty of the conservative, aristocratic or clerical elements, and the result has been the worst sort of instability.

Accountable to Whom?

The third issue is that of accountability. The wielder of political power over the society or its members must be accountable in some way to those affected by the power. For much of the power that corporations wield, there is accountability in the market place, but for some of the newer forms of political power, especially that wielded over the individual, accountability, if present at all, is only in its most rudimentary form.

If the industrial system had originated in a political process, there probably would have been a constitution for it, and legitimacy and account-

ability would have had tangible foundations. Because the corporate system was not the product of political processes, it has no ready-made constitution. Instead, the "constitution" must evolve slowly as the system itself evolves. We are in a transitional stage right now and cannot expect to see a full blown constitution emerge over-night. There are signs that the constitution is taking shape. There may be times when the natural processes are found to be too slow or heading in the wrong direction, and it may become necessary to use the political power of the state to protect the individual. This has already occurred in a few areas.

The Issues

We now turn our attention to a brief examination of some of the issues which the discussion of the changing corporate society has revealed.

Where the power of government is limited by the constitution and by responsibility to the electorate, the limitations on corporate power are more informal in nature, for example: having to obtain funds in the capital market, competition, public opinion, and the overriding political power of the state.

Public opinion is not a very satisfactory limitation because it is very slow to act and because, when it does act, it usually tends to be extreme. The political power of the state can and will be used in emergencies, but, otherwise, when used by itself, is not a very effective instrument for dealing with many of the day-to-day problems arising out of heavy concentrations of corporate power.

The capital market appears not to be the regulator it once was. From 1946 to 1953, 64% of corporate expenditures for capital improvements came from internal sources; in 1958, this figure was 82%.

Competition is still relied on as the chief limitation on corporate power, with important assists from the antitrust laws. However, in the oligopolistic industries dominated by a few giants, competition does not operate in the way one might expect and often becomes more like war or collusion than like a competitive struggle.

Trust Busting Failed

The antitrust laws have not proved to be effective tools in this connection. "Countervailing power," or the self-regulating effects of competitive power centers, has been suggested as a substitute for the classical forms of competition, but this view does not contain sufficient assurance to society or to individuals to be more than a transitional limitation. In other words, as the nature and extent of the concentration of corporate power have changed, many of the traditional restraints have weakened or disappeared. Are there any restraints in sight with which to fill the gap?

There are a number of possibilities. Let us look at an example or two. The automobile industry is characterized by a very few giants at the manufacturing level and by a very large number of small organizations at the dealer level. The cancellation or failure to renew a dealer franchise can wipe out a large personal investment and a lifetime of hard work, and the dealer is at the mercy of the giant organization from which he purchases his stock in trade.

A dealer whose franchise is revoked or cancelled or not renewed had no review, no appeal, no court action, no nothing. A few years ago, General

Motors set up its own review board to hear complaints from dealers who felt they had been unjustly treated. General Motors did not have to set up the board, and there is no guarantee that a dealer will get a fair hearing if he does appeal to the board, but it is something, perhaps a rudimentary beginning for what may become an internal constitutional law.

Rhode Island, a few years ago, set up a public administrative body to review automobile dealers' appeals, and in 1958, Congress passed the Automobile Dealers' Franchise Act permitting a dealer to sue in federal court if he feels he has been aggrieved by the failure of a manufacturer to act in good faith in terminating, cancelling or not renewing a franchise.

Corporate Constitutional Law?

Here we have evidence of the development in and around the corporate system of formal and informal procedure usually characteristic of governmental institutions. It has been argued that this trend will continue and that certain constitutional limitations on power, especially due process, may eventually be applied directly to the great corporations on three grounds: that they are instruments of the state, that they are acting under the requirements of the government, and that they have the economic and political power to invade materially a constitutional right.

The Supreme Court, in *Marsh* v. *Alabama*, held a private corporation to constitutional limitations on its public function when the right of free speech was invaded in a company owned town. How much farther is it to the application of the minimum standards of due process where constitutional rights are invaded or threatened? What is or is not a "public function" is only a matter of degree and interpretation.

Or is this the right approach? Do constitutional limitations bring rigidity, and might not this line of reasoning be inconsistent with what has been said about the daring and the innovative in politics having come from business enterprise?

The idea of due process is so deeply rooted in our social conscience as to make it unlikely that due process will be innovated out of existence. The innovation may well be the development of a corporate due process.

Signs of Schizophrenia

One thing is clear, however; corporate schizophrenia is rather prevalent in the land, especially among the larger corporations whose managers want to be identified with the private sector of the society yet feel a strong responsibility for education, government, slum clearance, civic welfare, foreign policy and other areas heretofore almost exclusively in the public domain.

Furthermore, it is rather difficult to classify as entirely private an organization whose annual budget is greater than that of most states, whose decisions affect every part of the society, whose employees are numbered in the hundreds of thousands and whose activities abroad may make up an important portion of American relations with other countries.

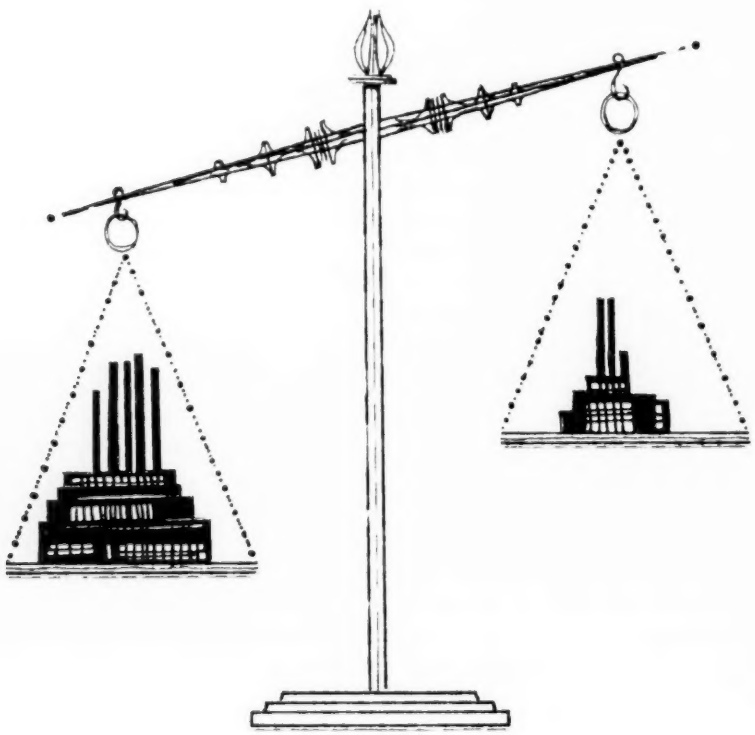
In which direction does the answer lie? The corporate system now represents one of the greatest concentrations of power, both economic and political, since the beginning of organized society. This power and its exercise have brought many benefits to mankind and will probably bring

many more, but power also brings problems of control, of responsibility, and of human rights.

Our constitutional system implies that the conscience of the state cannot be relied on when it comes to the exercise of power affecting the rights of individuals. Can we rely any more safely on the corporate conscience in the matter of power affecting individuals and other parts of society?

I believe that the answer lies in improving the art of statecraft to the point where it reflects our progress in technology and commerce and where it can cope with the unique and rapidly changing issues of modern society.

In the meantime, however, we must rely on the traditional limitations, especially those of the market place, and most important, must keep ourselves aware of the changes taking place and of the ramifications of those changes. This is not an easy task. History is not history when it is being made, and it takes a great deal of ingenuity and objectivity to be able to appraise one's own time and decide how best to assure a good life for those to come.



EDITORIAL POLICY

The *California Management Review* seeks to build a bridge between creative thought about management and executive action. In pursuit of this objective, the *Review* is intended to serve as an authoritative source of information and ideas contributing to the advancement of management. It is directed to active managers, scholars, teachers, and others concerned with management.

Specifically the *Review* will publish: 1/ Results of research in all areas of knowledge which have significance for the management of both public and private enterprises. 2/ Analyses of economic, political, and social issues and trends important to management. 3/ Descriptions and evaluations of new techniques in management. 4/ Discussions of theory, principles, and philosophy underlying business policies and operations. 5/ Reports of work in the other social sciences, in the humanities, and in the physical sciences having implications for management.

Manuscripts may be of whatever length necessary to present the material clearly and concisely. *They should be submitted in triplicate.*

The Editors extend a special invitation to readers of the *Review* to comment on the articles published. Comments and manuscripts should be addressed to:

Professor Elwood S. Buffa
California Management Review
Graduate School of Business Administration
University of California
Los Angeles 24, California

Professor David A. Alhadeff
California Management Review
Graduate School of Business Administration
University of California
Berkeley 4, California

McKINSEY AWARDS

Prizes of $1000 and $500 will be awarded annually to the authors of the two best articles appearing in the *Review* that year. These awards have been made possible by the McKinsey Foundation for Management Research, Inc. Neither the Editors nor members of McKinsey and Company are eligible for them.

SUBSCRIPTIONS

The *California Management Review* is published quarterly by the Graduate Schools of Business Administration, University of California, Berkeley and Los Angeles. Subscription rates are $6.50 for one year, $15.00 for three years. Single copies are $2.00. Prices for reprints are available upon request.

Make checks payable to The Regents of the University of California. Address all inquiries to:

California Management Review, University of California, Los Angeles 24, California.

Copyright by The Regents of the University of California, 1961.
Second-class postage paid at Los Angeles, California.